



TITLE:

Flora Desmidiarum Japonicarum II

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CITATION:

HIRANO, MINORU. Flora Desmidiarum Japonicarum II. Contributions from the Biological Laboratory, Kyoto University 1956, 2: 58

ISSUE DATE:

1956-01-30

URL:

<http://hdl.handle.net/2433/155899>

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Flora Desmidiarum Japonicarum II

Minoru HIRANO

Cosmariae LÜTKEM.

in Beitr. Biol. Pflanz. 8, 408, 1902; WEST Monogr. Brit. Desm. 1, 192, 1904.

Cellulae symmetricae, variables, generaliter constrictae in medio; membrana cum foraminibus, et duabus composita, correa externa glabra vel sculpturis regularibus conspicue ornata; punctulis divisionis cellularum semper fixis ad isthmum.

Docidium BRÉB.

in LUNDELL Nov. Act. Regn. Soc. Ups. 3, VIII, 88, 1871; WEST Monogr. Brit. Desm. 1, 193, 1904; SMITH Wisc. Bull. 57, 17, 1924; WEST & FRITSCH Treat. Brit. Alg. 272, 1927; KRIEGER Krypt. Fl. XIII, 1, 378, 1937; HIRANO Act. Phytotax. Geobot. 12, 17, 1943.

Cellulae rectae, elongatae, subcylindricae, multo longiores quam latiores, paullo constrictae ad medium; semicellulae cum lateribus rectis vel undulatis, apice truncato et glabro sine spinis vel tuberculis; basibus semicellularum inflatis et plicatis breve et longitudinalibus saepe granulis singulis in plicatis omnibus ornatis; chromatophoris axialibus et lamina longitudinali irregulariter et pyrenoidibus nonnullis in serie centralibus ordinatis; membrana glabra vel punctata; zygosporae non notae.

- 1a. Cellulae cum marginibus glabris ornatae **D. baculum**
1b. Cellulae cum marginibus lateralibus undulatis ornatae **D. undulatum**

Docidium baculum BRÉB. in RALFS Brit. Desm. 158, 1848; WEST Trans. Linn. Soc. Bot 5, 44, 1895; Monogr. Brit. Desm. 1, 193, 1904; ALLORGE Rev. Alg. 5, 347, 1930; KRIEGER Arch. Hydrobiol. Suppl. 11, 169, 1932; Krypt. Fl. XIII, 1, 379, 1937.

Cellulae elongatae, mediocres, circiter 20 longiores quam latae, leviter et gradatim attenuatae; semicellulae cum inflatione basali prominenti et subundulis supra basim, marginibus lateralibus rectis paene parallelis, plicationibus 10-12 (visis 6-7) ad basim ornatis. Long. 257 μ , Lat. 12.6 μ .

Hab. **Kiushiu**: Imuta-ike in Satsuma. (New to Japan) (Pl. X, fig. 13)

Distr. Manchuria, Burma, India, Ceylon, Java, whole Europe, N. & S. America, Madagascar, E. Africa.

Docidium undulatum BAIL. in TURNER K. Sv. Vet. Akad. Handl. 25, 35, 1893; WEST Monogr. 1, 194, 1904; HIGASHI List Jap. Freshw. Alg. 273, 1916; SMITH Wisc. Bull. 57, 18, 1924; KRIEGER Krypt. Fl. XIII, 1, 389, 1937; HIRANO Act. Phytotax. Geobot. 12, 17, 1943.

Cellulae mediocres, elongatae, 12-15 longiores quam latae, leviter constrictae, sinu late aperto; semicellulae leviter et gradatim attenuatae ad apices, apicibus truncatis et cum angulis apicalibus rotundis, marginibus lateralibus valide undulatis, undulis 7-8, cum plicationibus (et granulis) 11-12 ad basim semicellularum; membrana glabra. Long. 176-246 μ , Lat. 13-14.8 μ .

Hab. **Hondo**: Mt. Hakkoda, Hachiman-numa in Mutsu; Mt. Kurikoma, Ôyachi in Hachimantai in Rikuchû; Koke-numa in Ugo; Mt. Gassan in Uzen; Mt. Azuma in Iwashiro; Oze in Kôzuke; Mt. Naeba, Mt. Myôko in Echigo; Mt. Tateyama in Etchû; Shigakôgen, Mt. Kirigamine, Happô-ridge, Kazafuki-shinahachi-ike of Shirouma in Shinano. (Pl. X, fig. 14)

Distr. Japan, Siberia, India, Europe, Alaska, U. S. A., Guiana, Cuba.

Pleurotaenium NÄG.

in Gatt. einz. Alg. 104, 1849; WEST Monogr. Brit. Desm. 1, 197, 1904; SMITH Wisc. Bull. 57, 13, 1924; WEST & FRITSCH Treat. Brit. Alg. 272, 1927; KRIEGER Krypt. Fl. XIII, 1, 385, 1937; HIRANO Act. Phytotax. Geobot. 12, 18, 1943. SMITH Freshw. Alg. U. S. 319, 1950.

Cellulae rectae, elongatae, communiter magnae, circiter multo longiores quam latiores, paullo constrictae ad medium; semicellulae communiter cum parte basali inflata, lateribus rectis, undulatis vel nodulosis, leniter attenuatae versus polos, polis truncatis vel truncato-rotundis, glabris vel spinatis et verrucosis; membrana glabra, punctata vel scrobiculata; chromatophoris parietalibus numerosioribus, in bracteis longitudinalibus irregularibus ordinatis et in massa parva rhomboide fracta, cum singulis pyrenoidibus, raro axialibus longitudinalibus pyrenoidibus in seriebus centralibus ordinatis, prope apicem cellularum cum vacuo corpusculo contineus unus vel foluria crystallae gypsi qui motum brownianum demonstrant; zygosporae globosae, glabrae.

1a. Cellulae elongatae et cylindricae, marginibus lateralibus rectis vel undulatis

..... Sect. **Eupleurotaenium**

2a. Membrana glabra, punctata vel scrobiculata.

3a. Apice glabro.

4a. Chromatophoria axialia **Pl. minutum**

5a. Cellulae breves, circiter 4-5 longiores quam latiores var. **crassum**

5b. Cellulae modice longae, circiter 8-20 longiores quam latiores.

6a. Cellulae angustae, 6-15 μ in latitudinem.

7a. Cellulae relative breves, 8-12 longiores quam latiores f. **typica**

7b. Cellulae relative longae, 14-20 longiores quam latiores var. **gracile**

6b. Cellulae latae, 15-28 μ in latitudinem.

- 7a. Cellulae relative breves, 8-11 longiores quam latiores var. **latum**
 - 7b. Cellulae relative longae, 14-15 longiores quam latiores var. **cylindricum**
 - 5c. Cellulae summe longae, circiter 30-40 longiores quam latiores var. **elongatum**
 - 4b. Chromatophoria parietalia.
 - 5a. Cellulae cum undulis 1-3 supra inflatione basali praeditae.
 - 6a. Cellulae angustae et elongatae, circiter 20-40 longiores quam latiores, 13-23 μ in latitudinem **Pl. baculoides**
 - 6b. Cellulae latae, circiter 10-20 longiores quam latiores, 23-65 μ in latitudinem **Pl. Trabecula**
 - 7a. Cellulae breves et latae, circiter 9-10 longiores quam latiores var. **crassum**
 - 7b. Cellulae modice longae, circiter 11-18 longiores quam latiores.
 - 8a. Cellulae 14-23 μ in latitudinem var. **rectum**
 - 8b. Cellulae 28-40 μ in latitudinem f. **typica**
 - 7c. Cellulae elongatae, circiter 19-28 longiores quam latiores var. **elongatum**
 - 5b. Cellulae cum undulis multis supra inflatione basali praeditae, interdum marginibus totis undulatis.
 - 6a. Undulis lateralibus confiantibus in dimidia parte totius longitudinis **Pl. indicum**
 - 6b. Undulis lateralibus a basi ad apicem extensis.
 - 7a. Cellulae sine zona punctulorum **Pl. repandum**
 - 7b. Cellulae cum zona punctulorum ordinatae **Pl. annulare var. zonatum**
 - 3b. Apice cum annulare tuberculo praedito.
 - 4a. Tubercula sphaerica.
 - 5a. Cellulae cum prominenti inflatione basali praeditae.
 - 6a. Tubercula aspera disposita, circiter 6-8 visibiles trans apicem. **Pl. Ehrenbergii**
 - 7a. Margines cellularum non undulati praeter inflationis basim.
 - 8a. Cellulae breves, circiter 8-10 longiores quam latiores var. **curtum**
 - 8b. Cellulae modice longae.
 - 9a. Semicellulae non inflatae in medio f. **typica**
 - 9b. Semicellulae inflatae in medio var. **crenulatum**
 - 8c. Cellulae elongatae, circiter 20-25 longiores quam latiores var. **elongatum**
 - 7b. Margines cellularum undulati in totam longitudinem var. **undulatum**
 - 6b. Tubercula dense disposita, circiter 10 visibiles trans apicem **Pl. eugeneum**
 - 5b. Cellulae sine vel paullo inflatione basali praeditae, cellula crassa **Pl. truncatum**
 - 4b. Tubercula conica **Pl. excelsum**
 - 4c. Tubercula elongata **Pl. simplicissimum**
 - 5a. Cellulae angustae, circiter 32-34 μ in latitudinem f. **typica**
 - 5b. Cellulae maiores, circiter 52 μ in latitudinem var. **semiundatum**
- 3c. Apice cum annulari tuberculo plano praedito.

- 4a. Cellulae colonias breves formantes **Pl. subcoronulatum**
- 5a. Cellulae rectae **f. typica**
- 5b. Cellulae leviter undulatae in parte anteriorem **var. africanum**
- 4b. Cellulae solitariae **Pl. elatum**
- 5a. Cellulae distincte undulatae, undulis paucioribus **f. typica**
- 5b. Cellulae leviter undulatae, undulis multioribus **var. subundulatum**
- 3d. Apice cum annulari spina praedito.
- 4a. Cellulae parvae et angustae, 11-12 μ in latitudinem
..... **Pl. tridentulum** **var. breve**
- 4b. Cellulae magnae et crassae, 28-32 μ in latitudinem. **Pl. mamillatum**
- 2b. Membrana testudinis formae praedita.
- 3a. Apice glabro **Pl. trochiscum**
- 3b. Apice cum annulari tuberculo praedito **Pl. verrucosum**
- 1b. Cellulae elongatae et nodulosae **Sect. Docidiopsis**
- Species unica **Pl. nodosum**
- 1c. Cellulae elongato-ovatae, marginibus lateralibus convexis **Sect. Oontidium**
- 2a. Apice glabro **Pl. inermium**
- 2b. Apice cum annulari tuberculo praedito **Pl. ovatum**
- 1d. Cellulae cylindricae, cum annula spina praeditae **Sect. Spinulosae**
- Species unica **Pl. kayei**

Sect. **Eupleurotaenium** HIRANO, sect. nov.

Cellulae elongatae, cylindricae in margine rectae vel undulatae, apice glabro vel cum spina vel tubercula ordinato; in vertice visae circulares.

Pleurotaenium minutum (RALFS) DELP. in GRÖNBLAD Act. Soc. Faun. Flor. Fenn. 55, 4, 1924; KRIEGER Arch. Hydrobiol. Suppl. 11, 167, 1932; Krypt. Fl. XIII, 1, 390, 1937; HIRANO Act. Phytotax. Geobot. 12, 19, 1943. — *Penium minutum* (RALFS) CLEVE in K. Sv. Vet. Akad. Förhandl. 20, 493, 1863; WEST Monogr. Brit. Desm. 1, 101, 1904; MIGULA Krypt. Fl. II, 367, 1907; SMITH Wisc. Bull. 57, 8, 1924; FUJISAWA Journ. Jap. Bot. 10, 442, 1934; OKADA Journ. Imp. Fish. Inst. 30, 141, 1934.

Cellulae parvae, cylindricae, circiter 8-12 longiores quam latae, paullo constrictae; semicellulae sine inflatione, sensim attenuatae ad apices, lateribus rectis et subparallelis, apice truncato cum angulis apicalibus leviter rotundis; membrana glabra vel minute punctata; chromatophoris axialibus cum lamina circ. 6 irregulariter et pyrenoidibus 3-7 in serie unica centrali ornatis. Long. 50-95 μ , Lat. 14-15 μ .

Hab. **Hondo**: Mt. Hakkoda, Hachiman-numa in Mutsu; Mt. Kurikoma, Ôyachi of Hachimantai in Rikuchû; Hirumo-numa, Koke-numa in Ugo; Mt. Gassan, Mt. Azuma, Hijiori-naga-numa in Uzen; Nogiwano-kwannon-ike in Iwashiro; Oze in Kôzuke; Mt. Naeba, Mt. Myôko in Echigo; Mt. Tateyama in Etchû; Shigakôgen, Daimon-pass, Kirigamine, Happô-ridge, Mt. Kazafuki, Tengenohara of Shirouma in Shinano; Takashihara in Mikawa; Ishigaki-ike, Kanashôzu, Tamaru in Ise; Mt. Hira, Fuse-ike in

Oomi; Sawano-ike in Yamashiro. **Shikoku**: Yamada in Tosa. **Kiushiu**: Byakushi-ike of Mt. Kirishima, Imuta-ike in Satsuma. (Pl. X, fig. 7, 9.)

Distr. Japan, China, Java, Sumatra, Ceylon, whole Europe, N. America, Brazil, W. Africa.

var. **crassum** (W. WEST) KRIEGER in Arch. Hydrobiol. Suppl. **11**, 167, 1932; Krypt. Fl. XIII, **1**, 392, 1937; HIRANO Act. Phytotax. Geobot. **12**, 20, 1943. — *Penium minutum* (RALFS) CLEVE var. *crassum* W. WEST in Journ. Linn. Soc. Bot. **29**, 310, 1892; WEST Monogr. Brit. Desm. **1**, 105, 1904. — forma *inflata* WEST in Monogr. **1**, 105, 1904; OKADA Bot. Mag. **50**, 431, 1936.

Var. *cellulis brevioribus et crassioribus quam in forma typica, circiter 4-5 longioribus, apice lato et truncato. Long. 54-56 μ , Lat. 18 μ .*

Hab. **Hondo**: Mt. Azuma in Iwashiro; Ozegahara in Kôzuke; Mt. Naeba in Echigo; Mt. Kazafuki, Tengunohara of Shirouma in Shinano; Kanashôzu in Ise. (Pl. X, fig. 10)

Distr. Japan, British Isles, Lapland, Brazil, W. Africa.

var. **gracile** (WILLE) KRIEGER in Arch. Hydrobiol. Suppl. **11**, 167, 1932; TAYLOR Pap. Mich. Acad. Sci. **19**, 245, 1934; KRIEGER Krypt. Fl. XIII, **1**, 394, 1937. — *Penium minutum* (RALFS) CLEVE var. *gracile* WILLE in WEST Trans. Linn. Soc. Bot. **5**, 237, 1896; Monogr. Brit. Desm. **1**, 103, 1904.

Var. *cellulis gracilioribus et tenuioribus quam in forma typica, circiter 24 longioribus. Long. 208-240 μ , Lat. 9.8-15 μ .*

Hab. **Hokkaido**: Tomakomai in Iburi. **Hondo**: Akaiyachi in Iwashiro; Jôdo-ike in Ise; Shinohara-ike, Fuse-ike in Oomi; Mizoroga-ike in Yamashiro. (New to Japan)

Distr. Sakhalin, Sumatra, Ceylon, Europe, N. America, Brazil, Africa.

var. **latum** KAISER in KRIEGER Krypt. Fl. XIII, **1**, 394, 1937.

Var. *cellulis latioribus quam in forma typica, diametro circiter 8-9 longioribus. Long. 160-352 μ , Lat. 19-21 μ .*

Hab. **Hokkaido**: Tomakomai in Iburi. **Hondo**: Benze-numa in Mutsu; Izu-numa in Rikuzen; Nanko in Iwaki; Biwa-ike in Owari. (New to Japan) (Pl. X, fig. 6)

Distr. Sumatra, Europe.

var. **cylindricum** (BORGE) KRIEGER in Krypt. Fl. XIII, **1**, 393, 1937; HIRANO Act. Phytotax. Geobot. **12**, 20, 1943. — *Penium cylindricum* BORGE forma BORGE in Ark. Bot. **15**, 12, 1918.

Var. *cellulis gracilioribus, diametro circiter 14-15 longioribus, paullo constrictis. Long. 206-243 μ , Lat. 17-19 μ .*

Hab. **Hondo**: Mt. Hakkoda in Mutsu; Mt. Kurikoma in Ugo; Oze in Kôzuke; Shirouma-ôike, Kaminotanbo in Shinano. **Kiushiu**: Yabakei in

Bunzen; Imuta-ike in Satsuma. (Pl. X, fig. 2)

Distr. Japan, Brazil.

var. **elongatum** (W. & G. S. WEST) CEDERGREN in KRIEGER Arch. Hydrobiol. Suppl. **11**, 167, 1932; TAYLOR Pap. Mich. Acad. Sci. **19**, 246, 1934; KRIEGER Krypt. Fl. XIII, **1**, 393, 1937. — *Penium minutum* (RALFS) CLIVE var. *elongatum* W. & G. S. WEST in Monogr. Brit. Desm. **1**, 104, 1904.

Var. *cellulis elongatioribus*, diametro circiter 28-30 longioribus. Long. 288μ , Lat. 9.8μ .

Hab. **Hokkaido**: Kiritappu in Kushiro. (New to Japan) (Pl. X, fig. 1)

Distr. India, Ceylon, Sumatra, British Isles, N. America, Australia.

Pleurotaenium baculoides (ROY & BISS.) PLAYFAIR in KRIEGER Krypt. Fl. XIII, **1**, 404, 1937. — *Docidium baculoides* ROY & BISSET in Journ. Bot. **24**, 241, 1886. — *Docidium baculiforme* TURNER in K. Sv. Vet. Akad. Handl. **25**, 33, 1893. — *Pleurotaenium baculiforme* GRÖNBL. in Act. Soc. Faun. Flor. Fenn. **47**, 25, 1920.

Cellulae mediocres, graciles et elongatae, modice constrictae, circiter 25 longiores quam latae; semicellulae cum inflatione prominenti basali, lateribus rectis et fere parallelis, ad apices vix attenuatae, apicibus truncato-rotundis, chromatophoris parietalibus cum pyrenoidibus numerosis in serie in unaquaque semicellula. Long. $264-377\mu$, Lat. $15-18\mu$.

Hab. **Hokkaido**: Akan-junsai-numa in Kushiro. **Hondo**: Hirumo-numa, Megata in Ugo; Goda-numa in Shimofusa; Kotsutsumi-nishi-ike, Ô-numa in Mikawa; Fuse-ike in Oomi. **Kiushiu**: Imuta-ike in Satsuma. (Pl. X, fig. 12)

Distr. Japan, Korea, India, whole Europe, Caucasus, Australia, Africa.

Pleurotaenium Trabecula (EHRENB.) NAG. in Gatt. einz. Alg. 104, 1849; WEST Monogr. **1**, 209, 1904; MIGULA Krypt. Fl. II, 394, 1907; OKADA Bull. Biogeogr. Soc. Jap. **3**, 46, 1932; KRIEGER Krypt. Fl. XIII, **1**, 395, 1937; HIRANO Act. Phytotax. Geobot. **12**, 21, 1943.

Cellulae magnae, subcylindricae, diametro circiter 11-18 duplo longiores quam latiores, leviter constrictae; semicellulae cum inflatione prominenti basali et saepe subundulis 1-2 supra basim, lateribus paene rectis et parallelis, gradatim attenuatae ad apices, apice truncato-rotundo sine tuberculis vel spinis; chromatophoris parietalibus, laminae 3-4 visae, pyrenoidibus numerosis irregulariter ornatis; membrana punctata. Long. $384-616\mu$, Lat. $25-45\mu$.

Hab. **Hokkaido**: Okineppe, Onne-numa in Nemuro; Akan-junsai-numa in Kushiro; Toyokoro in Tokachi; Nikuru-numa, Wakkanai in Kitami; Shiraai-poroto-numa in Iburi; Moseushi, Horomui, Nakano near Sapporo in Ishikari; Junsai-numa, Ko-numa in Oshima. **Hondo**: Mt. Hakkoda, Kurobo-numa, Bora-numa in Mutsu; Naga-numa of Hachimantai, Hizume in Riku-

chû; Koke-numa, Karaso-numa, Moritake-ôtsutsumi, Megata, Hirumomuma, Kariwano in Ugo; Hakuryu-ko, Ôishita, Chûkawa-ike, Naga-numa of Mazawa in Uzen; Kesho-numa, Izu-numa, Naga-numa in Rikuzen; Ojiroi, Umaushi-numa in Iwaki; Kôriyama, Hôzawano-ike, Kagami-ishi-mura, Nogiwano-kwannon-ike, Akaiyachi in Iwashiro; Oze in Kôzuke; Goda-numa in Shimofusa; Sanpôji-ike in Musashi; Kôridono-ike, Kagami-ike of Matsunoyama in Echigo; Amaga-ike of Mt. Yatsugatake, Nata-ike of Otari, Kirigamine, Inago of Kitamaki-mura, Kanori-ike, Karuisawa, Kizaki, Kamikôchi in Shinano; Tanuki-numa in Suruga; Takashihara, Kotsutsumi-nishi-ike in Mikawa; Kanashôzu, Tamaru in Ise; Nukigawa, Matsubara-naiko, Fuse-ike, Higashikusano-mura, Mt. Hira in Oomi; Mizoroga-ike, Ariga-ike, Shakhachi-ike in Yamashiro; Ikejiri-ike in Tanba. **Shikoku**: Dôgo, Yodo-mura, Shiramizu-pass in Iyo; Yamada, Misato-mura in Tosa. **Kiushiu**: Kôgamura in Higo; Ahira in Ôsumi; Miyazaki in Hiuga. (Pl. X, fig. 5, 8, 11)

Distr. Japan, Korea, Manchuria, Siberia, China, Kôtôsho near Formosa, Sumatra, Java, Borneo, India, Thailand, Singapore, whole Europe, Iceland, Nova Zembla, Greenland, N. & S. America, Sandwich-Islands, tropical Africa.

var. **crassum** WITTR. in KRIEGER Krypt. Fl. XIII, 1, 399, 1937.

Cellulae diametro circiter 6-7 longiores, undulis basalibus nullis aliquando subundulis singulis supra basim. Long. 275μ , Lat. 42μ , Apic. 20μ .

Hab. **Shikoku**: Matsuyama in Iyo. (New to Japan) (Pl. X, fig. 3)

Distr. China, India, Germany, Switzerland, Sweden, Greenland, Nova Zembla.

var. **rectum** (DELP.) W. & G. S. WEST in Monogr. 1, 212, 1934; SMITH Wisc. Bull. 57, 14, 1924; OKADA Bull. Biogeogr. Soc. Jap. 3, 45, 1932; KRIEGER Krypt. Fl. XIII, 1, 422, 1937.

Var. cellulis tenuioribus cum inflatione prominente basali, apicibus late rotundis vel truncato-rotundis. Long. $256-493\mu$, Lat. $15.4-30\mu$, Apic. $11-16\mu$.

Hab. **Hokkaido**: Tokotan, Kiritappu in Kushiro; Toyokoro in Tokachi; Yasu-ushi in Teshio; Horomui, Moere-numa in Ishikari; Tomakomai in Ihuri. **Hondo**: Nagatai in northern foot of Mt. Iwaki in Mutsu; Koke-numa, Nishi-numa, Moritake-ôtsutsumi in Ugo; Naga-numa of Mazawa in Uzen; Izu-numa, Kesho-numa, Kirifushi-numa in Rikuzen; Akaiyachi, Nogiwano-kwannon-ike in Iwashiro; Umaushi-numa, Hibushi-numa in Iwaki; Kizaki, Ôhanami-ike, Mt. Kirigamine in Shinano; Ô-numa in Mikawa; Toba, Jôdo-ike in Ise; Mt. Hira, Nukigawa in Oomi; Mizoroga-ike, Shakhachi-ike, Sawano-ike in Yamashiro; Ikejiri-ike in Tanba. **Shikoku**: Yamada in Tosa. **Kiushiu**: Ahira in Ôsumi; Nakahama of Lake Ikeda in Satsuma. (Pl. X, fig. 4)

Distr. Japan, Manchuria, central China, Kôtôsho near Formosa, India, whole Europe, N. America, Brazil, Australia.

var. **elongatum** CEDERGREN in Ark. Bot. **13**, 12, 1913; KRIEGER Krypt. Fl. XIII, **1**, 399, 1937.

Cellulae longiores quam in forma typica, circiter 20 longiores. Long. 704–720 μ , Lat. 33.6–36.4 μ .

Hab. **Hokkaido**: Chôbushi-numa in Nemuro. **Hondo**; Rokujizo in Yamashiro. (New to Asia) (Pl. XI, fig. 2)

Distr. Germany, Hungary, Sweden.

Pleurotaenium indicum (GRUN.) LUND. in NORDSTEDT Lund Univ. Arssk. **16**, 2, 1880; SCHMIDLE Engl. Bot. Jahrb. **23**, 255, 1896; KRIEGER Krypt. Fl. XIII, **1**, 403, 1937.

Cellulae magnae et elongatae, circiter 20–22 longiores quam latiores, paullo constrictae; semicellulae cum inflatione prominenti basali et lateribus marginibus parallelis et undulatis, undulis ad apices minoribus, in parte superiore lateribus paene rectis; semicellulae attenuatae ad apices, apice truncato et sine tuberculis vel spinis; membrana distincte punctata. Long. 960 μ , Lat. 44.8 μ , Apic. 30.8 μ .

Hab. **Hokkaido**: Tomakomai in Iburi. (New to Asia) (Pl. XI, fig. 1)

Distr. Whole Europe, Greenland, N. America, New Caledonia, N. Africa.

Pleurotaenium repandum (WOLLE) KRIEGER in Krypt. Fl. XIII, **1**, 405, 1937.
— *Pleurotaenium Ehrenbergii* (BRÉB.) DE BARY var. *undulatum* SCHAARSCHM. in FUJISAWA Journ. Jap. Bot. **10**, 442, 1934.

Cellulae mediocres, tenues, circiter 18–19 longiores quam latiores; semicellulae cum subprominenti inflatione basali, leviter attenuatae ad apicem, lateribus parallelis et undulatis, undulis sensim et gradatim minoribus ad apicem, prope apicem lateribus rectis, apicibus truncato-convexis; membrana distincte scrobiculata. Long. 770 μ , Lat. 41 μ , Apic. 32.3 μ .

Hab. **Hondo**: Ô-numa in Uzen; Mt. Kirigamine (FUJISAWA) in Shinano. (Pl. XIII, fig. 1)

Distr. Japan, India, U. S. A.

Pleurotaenium annulare (W. WEST) KRIEGER var. **zonatum** HIRANO in Act. Phytotax. Geobot. **14**, 69, 1951.

Cellulae elongatiores quam in forma typica, punctulis in seriebus zonarum subtiliter ad partem angustis. Long. 336 μ , Lat. 30.8 μ , Apic. 16.8 μ .

Hab. **Hondo**: Kanashôzu in Ise. (Pl. XI, fig. 3)

Distr. Japan.

Pleurotaenium Ehrenbergii (BRÉB.) De BARY in Conj. 75, 1858; WEST Monogr. Brit. Desm. 1, 205, 1904; MIGULA Krypt. Fl. II, 393, 1907; HIGASHI List Jap. Freshw. Alg. 272, 1916; SMITH Wisc. Bull. 57, 15, 1924; OKADA Journ. Imp. Fish. Inst. 30, 148, 1934; KRIEGER Krypt. Fl. XIII, 1, 410, 1937.

Cellulae modicae, elongatae, modice constrictae, diametro circiter 11-13 longiores quam latiores; semicellulae modice inflatae ad basim, levissime attenuatae ad apices, lateribus paene rectis et parallelis sed supra inflationem basalem paullo undulatis, apicibus truncatis tuberculatis, cum tuberculis circ. 7-10 (visibiles 4-5) instructis; membrana punctata, laminae chromatophori parietales et circ. 2-3 visae cum multis pyrenoidibus. Long. 347-739 μ , Lat. 31-45 μ , Apic. 15-44 μ .

Hab. **Hokkaido**: Kiritappu in Kushiro; Wakkanai, Nikuru-numa in Kitami; Moseushi, Horomui in Ishikari. **Hondo**: Benze-numa, Komozuchi in Mutsu; Hizume in Rikuchû; Hirumo-numa, Kotomo-numa, Moritake-ôtsutsumi, Megata in Ugo; Eboshi-numa, Ô-numa, Ôishita, Chûkawa-ike, Naga-numa of Mazawa in Uzen; Ojiroi in Iwaki; Kobuchi-numa in Rikuzen; Akaiyachi in Iwashiro; Sanpôji-ike in Musashi; Matsunoyama in Echigo; Kamikôchi, Kizaki, Ashinota-ike in Shinano; Hichimenzan in Kai; Tanuki-numa in Suruga; Takashihara, Kotsutsumi-nishi-ike, Suhara-ike in Mikawa; Toba, Kanashôzu, Jôdo-ike, Ishigaki-ike in Ise; Lake Biwa, Fuse-ike, Shinohara-ike in Oomi; Mizoroga-ike, Ariga-ike, Shaku-hachi-ike, Ogura in Yamashiro. **Shikoku**: Dôgo near Matsuyama in Iyo. **Kiushiu**: Kôgamuta of Aso in Higo; Imuta-ike, Unagi-ike, Kagami-ike, Nakahara-ike in Satsuma; Miyazaki in Hiuga. (Pl. XI, fig. 6, 7, 9, 10)

Distr. Japan, the Kuriles, Siberia, China, India, Ceylon, Java, Borneo, Bali, whole Europe, Greenland, N. & S. America, Australia, Samoa, Hawaii, Africa, Madagascar.

var. **curtum** KRIEGER in Krypt. Fl. XIII, 1, 414, 1937.

In var. cellulae breviores quam in forma typica, diametro circiter 10-11 plo longiores, inflatione basali non conspicua. Long. 196 μ , Lat. 16.8 μ .

Hab. **Hondo**: Fuse-ike in Oomi. (New to Asia) (Pl. XI, fig. 8)

Distr. Germany, Spain, Brazil.

var. **crenulatum** (EHRENB.) KRIEGER in Krypt. Fl. XIII, 1, 413, 1937.

In var. semicellulae in parte basali cum duobus undulis prominentibus et in parte mediana leviter inflatae, gradatim attenuatae ad apices, in parte apicali prominente angustae, apice leviter convexo cum angulis rotundis. Long. 704 μ , Lat. 42 μ .

Hab. **Hondo**: Izu-numa in Rikuzen; Kôridonono-ike in Echigo; Inago-

of Kitamaki-mura in Shinano. (New to Asia) (Pl. XII, fig. 1)

Distr. Europe, Greenland, Australia, S. America.

var. **elongatum** (W. WEST) W. & G. S. WEST in Journ. Linn. Soc. Bot. **29**, 119, 1892; Monogr. Brit. Desm. **1**, 297, 1904; SMITH Wisc. Bull. **57**, 16, 1924; KRIEGER Krypt. Fl. XIII, **1**, 414, 1937.

Var. cellulis tenuioribus, diametro circiter 19-21 longioribus. Long. 432μ , Lat. 19.6μ .

Hab. **Hondo**: Kurobo-numa in Mutsu. (New to Asia) (Pl. XII, fig. 2)

Distr. Europe, U. S. A., Australia.

var. **undulatum** SCHAARSCHM. in SCHMIDLE Hedw. **34**, 390, 1895; WEST Trans. Linn. Soc. Bot. **6**, 145, 1902; SMITH Wisc. Bull. **57**, 15, 1924; KRIEGER Krypt. Fl. XIII, **1**, 415, 1937.

Var. lateribus marginibus undulatis sed rectis prope apicem. Long. $314-631\mu$, Lat. $32-37\mu$.

Hab. **Hondo**: Shinohara-ike in Oomi. **Kiushiu**: Nakahama of Lake Ikeda in Satsuma. (New to Japan) (Pl. XI, fig. 11, 12)

Distr. Manchuria, Siberia, China, Tibet, India, Ceylon, Sumatra, Hungary, Russland, N. & S. America, E. Africa.

Pleurotaenium eugeneum (TURNER) W. & G. S. WEST in Monogr. Brit. Desm. **1**, 202, 1904; GISTL Krypt. Forsch. **1**, 463, 1926; KRIEGER Krypt. Fl. XIII, **1**, 417, 1937. — *Docidium eugeneum* TURNER in K. Sv. Vet. Akad. Handl. **25**, 30, 1893.

Cellulae magnae, elongatae, circiter 11-13 longiores quam latiores, leviter constrictae; semicellulae cum inflatione prominenti basali, lateribus paene rectis vel nonnihil convexis, levissime et gradatim attenuatae ad apices, apice truncato et convexo, tuberculis sphaericis parvis circ. 20 (visibiles 8-9) instructis. Long. $448-528\mu$, Lat. $39-40\mu$, Apic. $30-31\mu$.

Hab. **Hondo**: Nenbutsu-ike in Shinano. (New to Japan) (Pl. XIII, fig. 2)

Distr. China, Singapore, India, Ceylon, British Isles, Germany, Switzerland, U. S. A., Colombia, Africa, Madagascar.

Pleurotaenium truncatum (BRÉB.) NÄG. in WEST Monogr. Brit. Desm. **1**, 203, 1904; MIGULA Krypt. Fl. II, 394, 1937; DICK Bot. Arch. **3**, 217, 1923; KRIEGER Krypt. Fl. XIII, **1**, 430, 1937.

Cellulae magnae, robustae, circiter 6-7 longiores quam latiores, modice constrictae, sinu late aperto; semicellulae leviter tumidae generalis sine inflatione basali, sed aliquando paullulum inflatione juxta supra sinum, attenuatae de medio ad apicem, apicibus truncatis vel truncato-convexis annulis tuberculorum circa 10 (visis 6) praeditis, marginibus lateralibus convexis; membrana punctata. Long. 480μ , Lat. 68.6μ , Apic. 28μ .

Hab. **Hokkaido**: Kiritappu in Kushiro. (New to Japan) (Pl. XII, fig. 10, 11)

Distr. Kuriles, Manchuria, China, India, whole Europe, Spitzbergen, Greenland, Nova Zembla, N. & S. America, New Zealand.

Pleurotaenium excelsum (TURNER) GUTW. in KRIEGER Krypt. Fl. XIII, 1, 416, 1937. — *Pleurotaenium rhomphaeum* (TURNER) OKADA in Bot. Mag. 50, 434, 1936. — *Docidium excelsum* TURNER in K. Sv. Vet. Akad. Handl. 25, 31, 1893.

Cellulae submediocres, graciles et elongatae, diametro circiter 19-24 longiores quam latiores; semicellulae cum inflatione prominenti basali et undulis minimis circiter 2-3 supra inflationem basalem, levissime attenuatae ad apices, lateribus rectis et paene parallelis, apicibus truncatis tuberculatis, tuberculis parvis conicis 6 (visibiles) instructis. Long. 312-370 μ , Lat. 16.8-19.6 μ .

Hab. **Hokkaido**: Kiritappu in Kushiro; Nikuru-numa in Kitami; Moseushi in Ishikari. **Hondo**: Kyutai in Mutsu; Koke-numa, Megata in Ugo; Ônuma, Ôishita in Uzen; Izu-numa in Rikuzen; Kôriyama, Hôzawa-ike, Nogiwano-kwannon-ike, Akaiyachi in Iwashiro; Kizaki, Kanori-ike in Shinano; Takashihara in Mikawa; Tanuki-numa in Suruga; Musashiranzan (OKADA) in Musashi; Ishigaki-ike, Jôdo-ike in Ise; Fuse-ike, Shinohara-ike in Oomi; Mizoroga-ike, Takaraga-ike, Sawano-ike in Yamashiro. **Shikoku**: Yamada in Tosa; Yamanouchi-mura in Sanuki. **Kiushiu**: Miyazaki in Hiuga; Ahira in Ôsumi. (Pl. XI, fig. 4, 5)

Distr. Japan, Java, Thailand, Singapore, India, U. S. A.

Pleurotaenium simplicissimum GRÖNBLAD in Act. Soc. Faun. Flor. Fenn. 47, 27, 1920; KRIEGER Krypt. Fl. XIII, 1, 418, 1937.

Cellulae magnae, tenues, diametro circiter 23-24 longiores quam latiores; semicellulae cum inflatione basali et subundulis circiter 4-5 supra basim, non attenuatae, lateribus rectis et parallelis in parte superiore, in parte inferiore subundulatis, apice paullo dilatato et convexo-truncato, corona verrucarum parvarum elongatarum ornatae; membrana scrobiculata, chromatophoris cum laminis parietalibus 5-6 et pyrenoidibus numerosis. Long. 848 μ , Lat. 33-34 μ , Apic. 28 μ .

Hab. **Hondo**: Ikejiri-ike in Tanba. (New to Asia) (Pl. XIII, fig. 6)

Distr. Germany, Finland.

var. **semiundatum** HIRANO in Act. Phytotax. Geobot. 14, 35, 1950.

Cellulae maiores, marginibus lateralibus inferioribus undulatis. Long. 1016 μ , Lat. 52 μ , Apic. 45 μ .

Hab. **Hondo**: Izu-numa in Rikuzen. (Pl. XIII, fig. 5)

Distr. Japan.

Pleurotaenium subcoronulatum (TURNER) W. & G. S. WEST in Trans. Linn. Soc. Bot. 5, 44, 1895; BERNARD Dep. agr. Indes. M  erl. 77, 1908; KRIEGER Arch. Hydrobiol. Suppl. 11, 168, 1932; OKADA Bot. Mag. 50, 430, 1936; KRIEGER Krypt. Fl. XIII, 1, 422, 1937.

Cellulae submagnae, robustae, diametro circiter 16-19 longiores quam latiores; semicellulae non attenuatae, cum inflatione prominenti basali, lateribus rectis parallelis sed leviter dilatatis prope apicem, apice truncato et leviter rotundo, tuberculis sphaericis 32-34 (visibiles 14-15) intra marginem apicis instructis; membrana punctata; chromatophoris cum pyrenoidibus numerosis. Long. 493-736 μ , Lat. 33.6-59 μ , Apic. 31-56 μ .

Hab. **Hondo**: Kurobo-numa, Naga-numa in Mutsu; Moritake-  tsutsumi, Megata in Ugo; H  zawa-ike in Iwashiro; Fuse-ike in Oomi; Ogura (OKADA), Mizoroga-ike, Takaraga-ike, Ariga-ike in Yamashiro. (Pl. XIV, fig. 1-3)

Distr. Japan, Java, Burma, India, Africa, Madagascar, Brazil, Australia.

var. **africanum** SCHMIDLE in KRIEGER Krypt. Fl. XIII, 1, 423, 1937.

Var. lateribus parallelis et non undulatis sed apicibus et basalibus cellularum inflatis. Long. 350-640 μ , Lat. 18-39 μ , Apic. 19.6-33.6 μ .

Hab. **Hokkaido**: Kiritappu in Kushiro; Tomakomai in Iburi. **Hondo**: K  ridon  -ike in Echigo; Sanp  ji-ike in Musashi. (New to Japan) (Pl. XIV, fig. 4)

Distr. Java, U. S. A., Brazil, Australia.

Pleurotaenium elatum (TURNER) BORGE in KRIEGER Arch. Hydrobiol. Suppl. 11, 166, 1932; Krypt. Fl. XIII, 1, 425, 1937.

Cellulae magnae, robustae, circiter 10-15 longiores quam latiores, levissime attenuatae; semicellulae cum inflatione prominenti basali, marginibus lateralibus undulatis, undulis numerosis, apice leviter expanso et truncato, tuberculis sphaericis numerosis (visibiles 14-16) intra marginem apicis instructis. Long. 524-847 μ , Lat. 52-55 μ .

Hab. **Kiushiu**: Nakahama of Lake Ikeda, Kagami-ike in Satsuma. (New to Japan) (Pl. XIII, fig. 3)

Distr. China, Singapore, India, Ceylon, Java, Africa, Cuba.

var. **subundulatum** HIRANO in Act. Phytotax. Geobot. 14, 35, 1950.

Cellulae leviter undulatae, undulis multioribus, punctulis infra apicem in serie verticalibus ordinatis. Long. 516-832 μ , Lat. 43-56 μ , Apic. 52-56 μ .

Hab. **Hondo**: Izu-numa in Rikuzen; K  riyama in Iwaki. (Pl. XIII, fig. 4)

Distr. Japan.

Pleurotaenium tridentulum (WOLLE) WEST var. **breve** HIRANO in Mem. Coll. Sci. Univ. Kyoto B, 19, 65, 1948.

Var. minor et brevior, circiter 10-12 plus longa quam lata; semicellulae apicem versus leviter attenuatae, angulis basalibus rotundatis non inflatis, marginibus lateralibus rectis, spinis minutissimis, membrana punctata. Long. 118-137 μ , Lat. 11.2-12.6 μ .

Hab. **Hondo**: Ozegahara in Kôzuke. (Pl. XII, fig. 3)

Distr. Japan.

Pleurotaenium mamillatum G. S. WEST in Journ. Bot. 43, 252, 1905; Journ. Linn. Soc. Bot. 39, 53, 1909; KRIEGER Krypt. Fl. XIII, 1, 499, 1937; HIRANO Journ. Jap. Bot. 20, 41, 1944.

Cellulae mediocres, diametro circiter 10 longiores quam latiores, leviter constrictae; semicellulae cum inflatione subprominenti basali, gradatim attenuatae ad apices, lateribus undulatis, apicibus truncatis cum angulis apicalibus leviter rotundis, spinis validis conicis circa 6-8 (visibiles 4-5) intra marginem apicis instructis. Long. 368 μ , Lat. 36.4 μ .

Hab. **Kiushiu**: Imuta-ike in Satsuma. (Pl. XII, fig. 4)

Distr. Japan, Australia.

Pleurotaenium trochiscum W. & G. S. WEST in Trans. Linn. Soc. Bot. 5, 235, 1896; 6, 142, 1902; Ann. Roy. Bot. Gard. Calcutta 6, 194, 1907; SMITH Wisc. Bull. 57, 17, 1924; KRIEGER Krypt. Fl. XIII, 1, 437, 1937.

Cellulae mediocres, robustae, diametro circiter 8 longiores quam latiores, paullo constrictae; semicellulae cum inflatione prominenti basali, leviter attenuatae ad apicem, apicibus truncatis et rectis cum angulis rotundis; membrana testudinis formae (circ. 10 in serie verticali), in medio majoribus et in parte apicis longioribus irregularibusque. Long. 323-330 μ , Lat. 38-39 μ , Apic. 21-22 μ .

Hab. **Hondo**: Kotsutsumi-nishi-ike in Mikawa. (New to Japan) (Pl. XV, fig. 2)

Distr. Thailand, Burma, Ceylon, Java, U. S. A., E. Africa.

Pleurotaenium verrucosum (BAIL.) LUND. in KRIEGER Krypt. Fl. XIII, 1, 438, 1937; PRESCOTT & SCOTT Trans. Amer. Micr. Soc. 61, 5, 1942; HIRANO Journ. Jap. Bot. 20, 42, 1944. — *Pleurotaenium trochiscum* W. & G. S. WEST var. *tuberculatum* SMITH in Wisc. Bull. 57, 17, 1924; OKADA Bot. Mag. 50, 257, 1936.

Cellulae mediocres, cylindricae, circiter 7-8 longiores quam latae, paullo constrictae; semicellulae cum prominenti inflatione basali, gradatim attenuatae ad apices, apice truncato-rotundo et tuberculato, tuberculis conicis 8-11 (visibiles 6) juxta marginem ornatis, membrana testudinis forma leviter in serie transverse ornata (circ. 10 in verticali serie). Long. 280-308 μ , Lat. 36.4-44.8 μ .

Hab. **Hondo**: Hakuryu-ko in Uzen; Ishigaki-ike, Kanashôzu in Ise; Shinohara-ike in Oomi; Ogura (OKADA) in Yamashiro. **Kiushiu**: Imuta-ike in Satsuma. (Pl. XV, fig. 1)

Distr. Japan, Java, Burma, India, Australia, N. America, Brazil, Africa.

Sect. **Docidiopsis** (RACIB.) HIRANO, comb. nov.

Docidiopsis RACIB. in Pamietn. Wydz. Akad. Umiej. Krakow **17**, 107, 1889. — *Docidium* subgen. *Hammatidium* TURNER in K. Sv. Vet. Akad. Handl. **25**, 39, 1893.

Cellulae elongatae, cylindricae sed nodulosae, apice glabro vel tubercula ordinato; in vertice visae sinuato-stellatae.

Pleurotaenium nodosum (BAIL.) LUND. in Nov. Act. Regn. Soc. Ups. **3**, VIII, 90, 1871; WEST Monogr. **1**, 214, 1904; MIGULA Krypt. Fl. II, 395, 1907; HIGASHI List Jap. Freshw. Alg. 272, 1916; SMITH Wisc. Bull. **57**, 16, 1924; FUJISAWA Journ. Jap. Bot. **10**, 445, 1934; KRIEGER Krypt. Fl. XIII, **1**, 436, 1937; HIRANO Act. Phytotax. Geobot. **12**, 20, 1943.

Cellulae relative magnae, nodulosae, diametro circiter 6-8 longiores quam latiores, leviter constrictae; semicellulae cylindricae, lateribus cum annulis nodulosis 6-8 in serie (annulus unicus ad basim, annuli tres equidistantibus inter basim et apicem), gradatim attenuatae ad apices, apicibus dilatatis truncatis, tuberculis conicis 7-9 (visibiles 5) intra marginem apicis instructis, membrana glabra, chromatophoris parietalibus 4 in unaquaque semicellula. Long. 283-398 μ , Lat. 47-54 μ .

Hab. **Hokkaido**: Kiritappu in Kushiro; Horomui in Ishikari. **Hondo**: Mt. Hakkoda, Benze-numa in Mutsu; Mt. Kurikoma, Moritake-ôtsutsumi, Megata, Hirumo-numa, Koke-numa in Ugo; Hakuryu-ko, Chûkawa-ike, Ôishita in Uzen; Nogiwano-kwannon-ike, Akaiyachi in Iwashiro; Kashima-chô in Iwaki; Ozegahara, Jiuemon-ike in Kôzuke; Happô-ridge, Kizaki in Shinano; Takashihara, Kotsutsumi-nishi-ike in Mikawa; Kanashôzu, Ishigaki-ike, Jôdo-ike in Ise; Higashikusano-mura, Shinohara-ike, Fuse-ike in Oomi; Mizoroga-ike, Takaraga-ike, Sawano-ike in Yamashiro. **Shikoku**: Yamada in Tosa. **Kiushiu**: Imuta-ike in Satsuma; Ahira in Ôsumi. (Pl. XII, fig. 8, 9)

Distr. Japan, Siberia, China, Singapore, Java, Burma, India, Ceylon, Europe, N. America, Brazil, Australia, New Zealand.

Sect. **Oontidium** (TURNER) HIRANO, comb. nov.

Docidium subgen. *Oontidium* TURNER in K. Sv. Ved. Akad. Handl. **25**, 39, 1893.

Cellulae elongatae et robustae sed elongato-ovatae, in margine convexae, apice glabro vel tubercula ordinato; in vertice visae circulares.

Pleurotaenium inermium (MÖB.) HIRANO, comb. nov. *Pleurotaenium ovatum* NORDST. var. *inermius* Möb. in KRIEGER Krypt. Fl. XIII, 1, 435, 1937. — *Pleurotaenium nipponicum* OKADA in Bot. Mag. 50, 84, 1936.

Cellulae mediocres, diametro circiter 4 longiores quam latiores, profunde constrictae, sinu aperto acutangulo in apice rotundo, isthmo cum annulis rufescentibus; semicellulae elongato-ovatae, angulis basalibus late rotundis, lateribus rectis vel levissime convexis, apicibus truncatis et rectis sine tuberculis. Long. 339–363 μ , Lat. 84–87 μ , Apic. 28 μ , Isthm. 44–45 μ .

Hab. **Hokkaido**: Tomakomai in Iburi. **Hondo**: Akaiyachi in Iwashiro (HINODE); Higashi-murayama near Tokyo (OKADA) in Musashi; Kanashôzu in Ise. **Kiushiu**: Ahira in Ôsumi. (Pl. XII, fig. 5)

Distr. Japan, Formosa, Australia, Brazil, Uruguay.

Pleurotaenium ovatum NORDST. in K. Sv. Vet. Akad. Handl. 22, 65, 1888; SCHMIDLE Engl. Bot. Jahrb. 26, 23, 1898; KRIEGER Krypt. Fl. XIII, 1, 434, 1937.

Cellulae magnae, circiter 2.5–3 longiores quam latiores, modice constrictae, sinu aperto et acutangulo in apice leviter obtuso; semicellulae elongato-ovatae, apicibus leviter convexis tuberculatis, tuberculis conicis 13–14 (visibiles 5–6) intra marginem apicis instructis; membrana scrobiculata. Long. 236–238 μ , Lat. 94–95 μ , Isthm. 51–52 μ .

Hab. **Hondo**: Shinohara-ike in Oomi. (New to Japan) (Pl. XIV, fig. 5)

Distr. Bengal, Java, Macassar, Australia, Africa, S. America.

Sect. **Spinulosae** HIRANO, sect. nov.

Cellulae elongatae, cylindricae in margine undulatae, cum seriebus spinarum a basi ad apicem ordinatae, apice spina ordinato.

Pleurotaenium kayei (ARCHER) RAËNH. in HIGASHI List Jap. Freshw. Alg. 272, 1916; WEST Trans. Linn. Soc. Bot. 6, 141, 1902; KRIEGER Arch. Hydrobiol. Suppl. 11, 167, 1932; Krypt. Fl. XIII, 1, 440, 1937.

Cellulae submagnae, crassae, circiter 5–7 longiores quam latae sine spinis, leviter constrictae; semicellulae non attenuatae vel levissime attenuatae ad apices, lateribus marginibus 4 undulatis (undulis singulis ad basim et undulis tribus equidistantibus), undulis cum duobus spinis validis in serie transverse, spinis leviter in parte exteriori directis, apicibus expansis et truncato-rotundis, spinis validis brevibus 10–15 (visibiles 9) intra marginem apicis instructis. Long. 336–384 μ , Lat. sine spin. 47.6–56 μ , cum spin. 61–70 μ .

Hab. **Hondo**: Chûkawa-ike in Uzen; Nogiwano-kwannon-ike in Iwashiro; Kotsutsumi-nishi-ike in Mikawa; Ishigaki-ike, Kanashôzu in Ise; Fuse-ike, Shinohara-ike in Oomi; Mizoroga-ike, Takaraga-ike, Ariga-ike in

Yamashiro. (Pl. XIV, fig. 6)

Distr. Japan, S. China, Java, Sumatra, India, Ceylon, Australia.

Triploceras BAILEY

in SMITH Wisc. Bull. **57**, 18, 1924; KRIEGER Krypt. Fl. XIII, **1**, 441, 1937; HIRANO Act. Phytotax. Geobot. **12**, 22, 1943; SMITH Freshw. Alg. U. S. 321, 1950.

Cellulae magnae, rectae, elongatae, cylindricae, multo longiores quam latiores, levissime constrictae; semicellulae leviter attenuatae versus polos, polis cum processibus apicalibus duabus longis oblique et alte directe ornatis, apicibus processuum truncatis spinis 2-3 acutis brevibus praeditis, lateribus valide undulatis cum seriebus transversis multis protuberantiis mamillatis, apicibus protuberantiarum spinatis vel truncato-verrucosis; membrana glabra; chromatophoris axialibus cum bractea longa, pyrenoidibus in serie centralibus ordinatis.

Triploceras gracile BAIL. in TURNER K. Sv. Vet. Akad. Handl. **25**, 25, 1893; G. S. WEST Journ. Linn. Soc. Bot. **39**, 54, 1909; KAWAMURA Freshw. Biol. **1**, 97, 1918; SMITH Wisc. Bull. **57**, 19, 1924; KRIEGER Krypt. Fl. XIII, **1**, 442, 1937.

Cellulae magnae, rectae, elongatae, circiter 10-15 longiores quam latiores cum protuberantiis; semicellulae gradatim attenuatae ad apices, marginibus lateralibus undulatis sed non prope apices, verticillis 11-15 in unaquaque semicellula, verrucis verticillorum mamillatis et spinatis (in parte superiore alte et in inferiore horizontaliter directis), apicibus semicellularum rectis cum processuum duo longos robustos oblique directos ornatis, apicibus processuum 2-aculeatis; membrana glabra; chromatophoris axialibus cum pyrenoidibus multis in serie centralia. Long. 320-330 μ , Lat. cum spin. 20-28 μ .

Hab. **Hokkaido**: Toyokoro in Tokachi; Tomakomai in Iburi. **Hondo**: Benze-numa in Mutsu; Koke-numa, Megata in Ugo; Hizume in Rikuchû; Hakuryu-ko, Chûkawa-ike, Junsai-numa of Ôishita in Uzen; Izu-numa, Kesho-numa in Rikuzen; Hôzawano-ike, Akaiyachi in Iwashiro; Ozegahara in Kôzuke; Shirouma-ôike in Shinano; Kotsutsumi-nishi-ike, Ô-numa in Mikawa; Jôdo-ike, Ishigaki-ike in Ise; Shinohara-ike in Oomi; Takaraga-ike, Mizoroga-ike in Yamashiro. **Kiushiu**: Imuta-ike in Satsuma. (Pl. XV, fig. 3, 4)

Distr. Japan, Siberia, Micronesia, Java, Sumatra, Burma, India, Ceylon, Sweden, Finland, N. America, Cuba, Brazil, Australia.

Ichthyocercus W. & G. S. WEST

in Journ. Bot. **35**, 89, 1897; KRIEGER Krypt. Fl. XIII, **1**, 449, 1937.

Cellulae sublongae, cylindrico-fusiformes, leviter compressae, paullo constrictae ad medium, sinu aperto; semicellulae cum lateribus subparallelis leviter convexis et angulis apicalibus cum spina subdivergente ornatae; membrana glabra, bilamellata; cellulae in vertice visae subcirculares.

Ichthyocercus longispinus (BORGE) KRIEGER in Krypt. Fl. XIII, 1, 450, 1937; HIRANO Act. Phytotax. Geobot. 13, 147, 1943. — *Ichthyocercus angolensis* W. & G. S. WEST var. *longispinus* BORGE in KRIEGER Arch. Hydrobiol. Suppl. 11, 216, 1932.

Cellulae submediocres, circiter 8 longiores quam latiores, leviter constrictae in medio, constrictione angustiore; semicellulae elongatae, gradatim attenuatae versus apices cum marginibus lateralibus subparallelis, angulis apicalibus in processus aequae longos oblique exterius directos productis, apicibus processuum rotundis spinis longis robustis ornatis; a latere visae elongato-fusiformes, lateribus paene parallelis et leviter convexis et subito attenuatis prope apicem, apice rotundato cum spinis longis robustis ornatis; membrana scrobiculata; chromatophoris cum duobus pyrenoidibus in unaquaque semicellula. Long. sine spin. 67–69 μ , Lat. 10–11 μ , Apic. 12–13 μ , Isthm. 7–8 μ .

Hab. **Hondo**: near Oomi-hachiman in Oomi. (Pl. XII, fig. 6, 7)

Distr. Japan, Sumatra.

Tetmemorus RALFS

in Brit. Desm. 145, 1848; WEST Monogr. Brit. Desm. 1, 216, 1904; SMITH Wisc. Bull. 57, 29, 1924; WEST & FRITSCH Treat. Brit. Alg. 274, 1927; KRIEGER Krypt. Fl. XIII, 1, 451, 1937; HIRANO Act. Phytotax. Geobot. 12, 23, 1943; SMITH Freshw. Alg. U. S. 321, 1950.

Cellulae elongatae, rectae, cylindricae vel fusiformes, leviter compressae ad apicem, nonnullo longiores quam latiores, paullo constrictae ad medium, sinu semper aperto; semicellulae cum lateribus parallelis vel leniter attenuatis versus apices, apicibus rotundis cum incisura mediana profunda; membrana glabra, punctata vel minute scrobiculata; chromatophoris axialibus cum bracteis radialibus longis et pyrenoidibus in serie centralibus; zygosporae globosae glabrae vel subquadratae cum angulis rotundis.

- 1a. Marginibus lateralibus paene parallelis, punctulis confertim in seriebus longitudinalibus ordinatis. **T. Brébissonii**
- 2a. Cellulae magnae, 100–264 μ in longitudinem. **f. typica**
- 2b. Cellulae parvae, 57–100 μ in longitudinem. **var. minor**
- 1b. Marginibus lateralibus non parallelis, gradatim attenuatis versus apices, punctulis aspere in seriebus obliqualibus ordinatis.
- 2a. Cellulae leviter attenuatae prope apices, apice non incrassato **T. laevis**
- 3a. Cellulae parvae, 70–120 μ in longitudinem **f. typica**
- 3b. Cellulae magnae, 115–153 μ in longitudinem **var. tropicus**
- 2b. Cellulae distincte attenuatae versus apices, apice incrassato **T. granulatus**

Tetmemorus Brébissonii (MENEGH.) RALFS in Brit. Desm. 145, 1848; WEST Monogr. Brit. Desm. **1**, 216, 1904; MIGULA Krypt. Fl. II, 391, 1907; SMITH Wisc. Bull. **57**, 20, 1924; KRIEGER Krypt. Fl. XIII, **1**, 452, 1937; HIRANO Journ. Jap. Bot. **20**, 43, 1944.

Cellulae mediocres, subcylindricae, 4-6 longiores quam latiores, modice constrictae, sinu aperto acutangolo; semicellulae paullo attenuatae versus apices, apicibus late rotundis cum incisura mediana profunda ad extremitatem subampliata, marginibus lateralibus rectis et paene parallelis; membrana dense punctata, punctulis in seriebus longitudinalibus et regularibus; a latere visae fusiformes. Long. 117-120 μ , Lat. 25-26 μ .

Hab. **Shikoku**: Yamada in Tosa. **Kiushiu**: Imuta-ike in Satsuma. (Pl. XIII, fig. 8)

Distr. Japan, Siberia, India, Sumatra, whole Europe, N. & S. America, Africa, Azores.

var. **minor** De BARY in Conj. 73, 1858; WEST Monogr. Brit. Desm. **1**, 218, 1904; OKADA Journ. Imp. Fish. Inst. **30**, 150, 1934; TAYLOR Pap. Mich. Acad. Sci. **20**, 210, 1935; KRIEGER Krypt. Fl. XIII, **1**, 454, 1937; HIRANO Act. Phytotax. Geobot. **12**, 24, 1943.

Cellulae dimidiores, marginibus lateralibus leviter retusis prope basim semicellulae. Long. 59-95 μ , Lat. 17-22 μ , Isthm. 14-17 μ .

Hab. **Hokkaido**: Kiritappu in Kushiro. **Hondo**: Mt. Hakkoda in Mutsu; Mt. Hachimantai in Rikuchû; Koke-numa, Mt. Kurikoma in Ugo; Mt. Gassan, Hijiori-naga-numa in Uzen; Ojiroi in Iwaki; Oze in Kôzuke; Mt. Naeba in Echigo; Mt. Tateyama, Tarobei-daira in Etchû; Yashimagaike of Mt. Kirigaminé, Tengunohara, Shigakôgen in Shinano; Takashihara in Mikawa; Tamaru, Jôdo-ike, Ishigaki-ike in Ise; Mt. Hira in Oomi; Sawano-ike, Ko-ike in Yamashiro. **Kiushiu**: Byakushi-ike of Mt. Kirishima in Hiuga. (Pl. XIII, fig. 7)

Distr. Japan, N. Kuriles, whole Europe, N. America.

Tetmemorus laevis (KÜTZ.) RALFS in Brit. Desm. 146, 1848; WEST Monogr. Brit. Desm. **1**, 222, 1904; FUJISAWA Journ. Jap. Bot. **10**, 445, 1934; OKADA Journ. Imp. Fish. Inst. **30**, 151, 1934; KRIEGER Krypt. Fl. XIII, **1**, 455, 1937; HIRANO Act. Phytotax. Geobot. **12**, 25, 1943.

Cellulae parvae, 3-4 longiores quam latae, leviter constrictae, sinu depresso; semicellulae gradatim attenuatae ad apicem, apicibus rotundis cum incisura mediana profunda, marginibus lateralibus leviter convexis; membrana subtiliter et sparse punctata; chromatophoris cum pyrenoidibus 3-5 in seriebus centralibus in unaquaque semicellula; a latere visae fusiformes, lateribus plus attenuatae quam in fronte visae. Long. 53-120 μ , Lat. 18-32 μ .

Hab. **Hokkaido**: Chôbushi-numa in Nemuro; Kiritappu in Kushiro. **Hondo**: Mt. Hakkoda, Hachiman-numa in Mutsu; Mt. Hachimantai,

Yatsumanako of Mt. Iwate in Rikuchû; Koke-numa, Hirumo-numa, Ogata, Mt. Kurikoma, Mt. Komagatake in Ugo; Mt. Azuma, Kaibai-ike, Mt. Gassan, Sugigamine of Mt. Zawo in Uzen; Kesho-numa in Rikuzen; Kashima-chô in Iwaki; Ôuchi-numa, Nogiwano-kwannon-ike in Iwashiro; Ozegahara, Mt. Akagi in Kôzuke; Senjôgahara, Shimizu-daira of Mt. Nasu in Shimotsuke; Mt. Myôko, Mt. Naeba, Kôridonono-ike in Echigo; Mt. Tateyama, Kumono-taira, Tarobei-daira, Kurobegoro-daira in Etchû; Kamikôchi, Happô-ridge, Mt. Kazafuki, Shigakôgen, Daimon-pass, Mt. Kirigamine, Mt. Sanpôga-mine, Kizaki, Ashinota-ike in Shinano; Kotsutsumi-nishi-ike in Mikawa; Kanashôzu, Ishigaki-ike in Ise; Oku-ike of Higashikusano-mura, Mt. Hira in Oomi; Takaraga-ike, Ko-ike in Yamashiro. **Shikoku**: Yamada in Tosa. **Kiushiu**: Hirabaru of Yabakei in Buzen; Bôgatsuru of Mt. Kujû in Bungo; Mt. Kirishima in Hiuga; Kôgamuta of Aso in Higo. (Pl. XIV, fig. 7)

Distr. Japan, the Kuriles, Malay, whole Europe, Nova Zembla, Greenland, N. & central America, Australia, New Zealand, Africa, Azores.

This species is one of the proper members of the *sphagnum*-moors or bogs in the mountain regions and often occurs in the swamps on the lowland. In south-western Japan it is rather rare and is confined to the moor or mountain-bog.

var. **tropicus** KRIEGER in Krypt. Fl. XIII, 1, 457, 1937; HIRANO Journ. Jap. Bot. 20, 43, 1944. — *Tetmemorus laevis* (KÜTZ.) RALFS forma KRIEGER in Arch. Hydrobiol. Suppl. 11, 217, 1932.

Cellulae maiores, circiter 5-plus longiores. Long. 134μ , Lat. 28μ .

Hab. **Kiushiu**; Imuta-ike in Satsuma. (Pl. XIV, fig. 8)

Distr. Japan, Java, Sumatra.

Tetmemorus granulatus (BRÉB.) RALFS in Brit. Desm. 147, 1848; WEST Monogr. Brit. Desm. 1, 219, 1904; OKADA Journ. Imp. Fish. Inst. 30, 150, 1934; KRIEGER Krypt. Fl. XIII, 1, 458, 1937; HIRANO Act. Phytotax. Geobot. 12, 24, 1943.

Cellulae relative magnae, fusiformes, circiter 5-6 longiores quam latae, leviter constrictae, sinu depresso; semicellulae attenuatae versus apices, apicibus acute rotundis cum incisura mediana profunda ad extremitatem subampliata, marginibus lateralibus leviter convexis; membrana subtiliter scrobiculata, scrobiculis in parte basali semicellulae in seriebus horizontalibus et in ceteris partibus in seriebus obliquis et irregularibus; chromatophoris cum pyrenoidibus 4-5 in seriebus centralibus; a latere visae fusiformes, subito attenuatae prope apicem. Long. $160-184\mu$, Lat. $28-30\mu$, Isthm. $24-25\mu$.

Hab. **Hokkaido**: Chôbushi-numa in Nemuro; Kiritappu in Kushiro.

Hondo: Mt. Hakkoda in Mutsu; Mt. Hachimantai, Mt. Kurikoma in Rikuchû; Mt. Komagatake, Koke-numa in Ugo; Mt. Gassan, Hakuryu-ko in Uzen; Ozegahara, Ômine-numa in Kôzuke; Senjôgahara in Shimotsuke; Mt. Myôko in Echigo; Shigakôgen, Mt. Kirigamine, Inago of Kitamaki-mura, Mt. Kazafuki, Happô-ridge, Tengunohara in Shinano; Ishigaki-ike in Ise; Fuse-ike in Oomi; Sawano-ike in Yamashiro. (Pl. XV, fig. 5, 6)

Distr. Japan, the Kuriles, Siberia, China, Java, Borneo, Ceylon, whole Europe, Greenland, Iceland, N. America, Sandwich Island, Australia, Azores.

The species is often found in the mountain bogs or dystrophic waters on lowland and is sometimes found in the *sphagnum*-moor into which flows the terrestrial stream water. It will not be a true member of the high moor.

Cosmarium CORDA

in RALFS Brit. Desm. 91, 1848; De BARY Conj. 72, 1858; RABENHORST Flor. Europ. Alg. 3, 157, 1868; HANSRICH Arch. naturw. Landes. Bôhm. 6, 192, 1888; WEST Monogr. Brit. Desm. 2, 125, 1905; SMITH Wisc. Bull. 57, 28, 1924; WEST & FRITSCH Treat. Brit. Alg. 276, 1927; HIRANO Act. Phytotax. Geobot. 12, 77, 1943; SMITH Freshw. Alg. U. S. 2nd ed. 323, 1950.

Cellulae summe variables, generalis leviter longae quam latae, interdum duplo longiores quam latiores, generaliter compressae, conspicue et profunde constrictae ad medium, sinu angusto-lineari vel aperto aliquando leviter profundo; semicellulae summe variables, ellipticae, subcirculares, semicirculares, subquadratae, truncato-pyramidatae vel reniformes, apicibus rotundis, truncatis vel convexis sed sine incisura apicalis, in medio semicellularum aliquando protuberantiis ornatis; a vertice visae generaliter ellipticae, subellipticae vel oblongae raro circulares; a latere visae communiter circulares; chromatophoris axialibus vel parietalibus singulis vel nonnullis cum pyrenoidibus singulis vel raro duabus; membrana glabra, punctata, scrobiculata, granulata, verrucosa vel papillata in definitis situs ordinatis; zygosporae variables, globosae, ellipsoides vel quadratae; membrana glabra, scrobiculata, papillata vel spinata.

- 1a. Cellulae in vertice visae circulares vel subcirculares; cellulis generalis elongatis. Subgen. **Dysphinctium**
- 1b. Cellulae compressae, in vertice visae ellipticae vel oblongae Subgen. **Eucosmarium**
- 1c. Cellulae compressae, in vertice visae semicirculares vel semiellipticae Subgen. **Nothocosmarium**

Subgen. Dysphinctium NÄG. emend. HIRANO

Dysphinctium NÄG. in Gatt. einz. Alg. 109, 1849—*Pleurotaeniopsis* LUNDELL in Nov. Act. Regn. Soc. Ups. 3, VIII, 51, 1871. (pro parte)

Cellulae generalis longae, cylindricae vel subcylindricae, 2-3 longiores quam latiores, paullo vel profunde constrictae, in vertice visae circulares vel subcirculares; chromatophoris parietalibus vel axialibus.

- 1a. Membrana glabra, punctata vel scrobiculata.
- 2a. Cellulae cylindricae vel subcylindricae, paullo constrictae Sect. *Actinotaenium*
- 2b. Cellulae biglobosae, profunde constrictae, semicellulae globosae. Sect. *Eudysphinctium*
- 1b. Membrana granulata, verrucosa.
- 2a. Cellulae cylindricae vel subcylindricae, paullo constrictae Sect. *Calocylindrus*
- 2b. Cellulae biglobosae, profunde constrictae, semicellulae globosae Sect. *Orbiculatae*

Sect. *Actinotaenium* (NÄG.) HIRANO, comb. nov.

Dysphinctium subgen. *Actinotaenium* NÄG. in Gatt. einz. Alg. 109, 1849. — *Cosmarium* sect. *Cucurbitinae* CEDERGREN in Ark. Bot. 25A:4, 43, 1933. — subgen. *Pleurotaeniopsis* LUND. in Nov. Act. Regn. Soc. Ups. 3, VIII, 51, 1871 (pro parte) — *Actinotaenium* (NÄG.) TEIL. in Bot. Notis. 385, 1954.

Cellulae elongatae, cylindricae, subcylindricae vel subfusiformes, diametro circiter 1.5-3 longiores quam latiores, paullo constrictae, sinu depresso.

- 1a. Cellulae circiter 2-3 longiores quam latiores.
- 2a. Cellulae cum marginibus lateralibus convexis, apice late rotundo.
- 3a. Cellulae cum chromatophoris parietalibus *C. Hibernicum*
- 3b. Cellulae cum chromatophoris axialibus.
- 4a. Cellulae non attenuatae in medio.
- 5a. Cellulae minutae, 7-10 μ in latitudinem *C. goniodes*
- 5b. Cellulae modicae, 21-45 μ in latitudinem.
- 6a. Cellulae 3 longiores quam latae, 21 μ in latitudinem ... *C. magellanicum*
- 6b. Cellulae 2-2.5 longiores quam latae, 22-23 μ in latitudinem.. *C. oblongum*
- 6c. Cellulae circiter duplo longiores quam latae, 23-55 μ in latitudinem *C. diplosporum*
- 7a. Cellulae modicae, 23-33 μ in latitudinem f. *typica*
- 7b. Cellulae magnae, 48-55 μ in latitudinem var. *major*
- 4b. Cellulae gradatim attenuatae ad polos.
- 5a. Cellulae sine granulis prope apicem, cellulae parvae *C. cucurbitinum*
- 6a. Cellulae 65-84 μ in longitudinem f. *typica*
- 6b. Cellulae 50-58 μ in longitudinem f. *minor*
- 5b. Cellulae cum granulis prope apicem ordinatae, cellulae magnae .. *C. Clevei*
- 2b. Cellulae cum marginibus lateralibus rectis, apice truncato.
- 3a. Cellulae 33-50 \times 15-24 μ , membrana punctata *C. cucurbita*
- 4a. Cellulae circiter duplo longiores quam latiores f. *typica*
- 4b. Cellulae 1.5 longiores quam latiores f. *latior*
- 3b. Cellulae 30-40 \times 14-17 μ , membrana glabra *C. parvulum*
- 1b. Cellulae circiter 1.5-2 longiores quam latiores.
- 2a. Cellulae parvae, 10-33 μ in latitudinem.

- 3a. Sinu rotundo **C. viride**
 - 4a. Cellulae $41-55 \times 23-33\mu$ f. **typica**
 - 4b. Cellulae $28-33 \times 18-19\mu$ f. **minor**
- 3b. Sinu acuto.
 - 4a. Cellulae cum marginibus lateralibus convexis.
 - 5a. Cellulae subcirculares **C. globosum**
 - 6a. Cellulae $30-36 \times 20-25\mu$.
 - 7a. Punctula indistincta f. **typica**
 - 7b. Punctula distincta; cellulae leviter longiores var. **subaltum**
 - 6b. Cellulae $17-24 \times 12-18\mu$.
 - 7a. Cellulae in vertice visae circulares f. **minor**
 - 7b. Cellulae in vertice visae ellipticae var. **minus**
 - 5b. Cellulae subovatae **C. pseudarctium**
 - 6a. Cellulae in vertice visae circulares.
 - 7a. Membrana incolora.
 - 8a. Cellulae $16-24 \times 11-18\mu$ f. **typica**
 - 8b. Cellulae $12-13 \times 6-7\mu$ var. **perminutum**
 - 7b. Membrana colorata, lutescens var. **colorum**
 - 6b. Cellulae in vertice visae trigonae var. **trigonum**
 - 4b. Cellulae cum marginibus lateralibus rectis **C. curtum**
- 2b. Cellulae modice magnae, $33-74\mu$ in latitudinem.
 - 3a. Chromatophoria parietalia **C. subturgidum**
 - 4a. Cellulae magnae, $140-150 \times 66-74\mu$ f. **typica**
 - 4b. Cellulae parvae, $77-120 \times 50-64\mu$ f. **minor**
 - 3b. Chromatophoria axialis.
 - 4a. Semicellulae semiellipticae **C. australe**
 - 4b. Semicellulae semicirculares **C. alpestre**

Cosmarium Hibernicum WEST in Monogr. Brit. Desm. 3, 114, 1908; GRÖNBLAD Act. Soc. Faun. Flor. Fenn. 49, 42, 1921.

Cellulae submagnae, subcylindricae, circiter duplo longiores quam latiores vel plus longiores, paullo constrictae, sinu tenue depressioni; semicellulae oblongo-ellipticae, apice late rotundato; a vertice visae circulares; membrana punctata. Long. 96.8μ , Lat. 45.2μ , Lat. isth. 44μ .

Hab. **Hondo**: Kotsutsumi-nishi-ike in Mikawa. (New to Asia) (Pl. XVI, fig. 24)

Distr. British Isles, Finland.

Cosmarium goniodes W. & G. S. WEST in Trans. Linn. Soc. Bot. 5, 70, 1895; HIRANO Act. Phytotax. Geobot. 12, 159, 1943.

Cellulae minutae, circiter 1.5 longiores quam latae, levissime constrictae, sinu depresso; semicellulae subcylindricae vel elongato-rectangulares, marginibus lateralibus paullo convexis, apicibus truncatis leviter convexis cum angulis apicalibus rotundis; membrana minute punctata, punctulis in seriebus transversis trans semicellulam ordinatis; a vertice visae circulares; a

latere visae ut in fronte visae. Long. $16.8-21\mu$, Lat. $6.4-7\mu$, Lat. isth. 6.4μ .

Hab. **Hondo**: Senninta-moor of Mt. Hakkoda in Mutsu; Yahei-daira of Mt. Azuma in Uzen; Kurobishi of Happô-ridge in Shinano; Mt. Hira in Oomi; Mizoroga-ike in Yamashiro. (Pl. XV, fig. 9, 10)

Distr. Japan, England, Germany, Madagascar.

Cosmarium magellanicum (BORGE) HIRANO, comb. nov. *Penium magellanicum* BORGE in Bot. Stud. tillägnade Kjellman Upsala 29, 1906.

Cellulae mediocres, elongatae, circiter 3 longiores quam latiores, paullo constrictae, sinu aperto et depresso; semicellulae elongato-subrectangulares, marginibus lateralibus paene parallelis et leviter convexis, gradatim attenuatae versus apicem, apicibus late rotundis; a vertice visae circulares; membrana punctata. Long. 71μ , Lat. 21.5μ .

Hab. **Hondo**: Takaraga-ike in Yamashiro. (New to Asia) (Pl. XVI, fig. 21)

Distr. S. America.

This extremely elongate form of *Cosmarium* is like the *Penium* species but its punctation of cell wall, the possession of median constriction, though it is very slight, are characteristic of *Cosmarium* and this species seems probably to show the close relation between *Cosmarium* and *Penium*.

Cosmarium oblongum BENNETT in WEST Monogr. Brit. Desm. 3, 114, 1908.

Cellulae submediocres, cylindricae, circiter $2\frac{1}{2}$ longiores quam latae, paullo constrictae, sinu latissime aperto et depresso; semicellulae oblongae vel nonnihil ellipticae; a vertice visae circulares; membrana glabra. Long. $50-56\mu$, Lat. 22.4μ , Lat. isth. $19.6-21\mu$.

Hab. **Hondo**: Karaso-numa in Ugo; Izu-numa in Rikuzen; Lake Kizaki, Nenbutsu-ike in Shinano. (New to Asia) (Pl. XVI, fig. 1, 4)

Distr. British Isles, France.

The isthmus of our *Cosmarium oblongum* is broader than the British dimension. The species is a rare one in our country.

Cosmarium diplosporum (LUND.) LÜTKEM. in CARTER Record Bot. Surv. India 9, 289, 1926; ALLORGE Rev. Alg. 5, 355, 1930 — *Cylindrocystis diplospora* LUND. in Nov. Act. Reg. Soc. Ups. ser. 3, VIII, 83, 1871; WEST Monogr. Brit. Desm. 1, 61, 1904.

Cellulae mediocres, circiter duplo longiores quam latiores, paullo constrictae, sinu depresso; semicellulae subellipticae, apicibus late rotundis; a vertice visae circulares; membrana glabra; chromatophoris axialibus cum pyrenoidibus centralibus in unoquoque semicellula. Long. 53μ , Lat. 28μ , Lat. isth. 27.3μ .

Hab. **Hondo**: Hizume in Rikuchû. (New to Japan) (Pl. XV, fig. 11)

Distr. India, Europe, Greenland, U. S. A., New Zealand.

var. **major** WEST *Cylindrocystis diplospora* LUND. var. *major* WEST in Monogr. Brit. Desm. **1**, 61, 1904.

Cellulae maiores. Long. 98μ , Lat. 45μ .

Hab. **Hondo**: Hizume in Rikuchû. (New to Asia) (Pl. XV, fig. 12)

Distr. British Isles.

Cosmarium cucurbitinum (BISS.) LÜTKEM. in Verh. k. k. zool. bot. Ges. Wien **60**, 487, 1910; WEST & CARTER Monogr. Brit. Desm. **5**, 267, 1923; TAYLOR Pap. Mich. Acad. Sci. **19**, 252, 1934; GRÖNBLAD Mem. Soc. Faun. Flor. Fenn. **10**, 267, 1934; HIRANO Act. Phytotax. Geobot. **12**, 89, 1943. — *Penium cucurbitinum* BISSET in WEST Monogr. Brit. Desm. **1**, 94, 1904.

Cellulae mediocres, subcylindricae, circiter 2.5 longiores quam latiores, levissime constrictae, sinu depresso; semicellulae subsemifusiformes et attenuatae ad apicem, marginibus lateralibus convexis, apicibus late rotundis; membrana sparse punctata sed fine granulata prope apicem; chromatophoris cum 5-6 laminis lateralibus et pyrenoidibus in unoquoque semicellula. Long. $56.4-73\mu$, Lat. $28-30\mu$, Lat. isth. $27.3-28\mu$.

Hab. **Hokkaido**: Mt. Daisetsu in Ishikari; Shizukari in Oshima. **Hondo**: Suiren-numa of Mt. Hakkoda, Kurobo-numa in Mutsu; Koke-numa, Hirumo-numa, Megata in Ugo; Ôishita, Hijiori-naga-numa in Uzen; Akai-yachi in Iwashiro; Oze, Ômine-numa in Kôzuke; Tanuki-numa in Suruga; Mt. Kirigamine in Shinano; Ishigaki-ike, Kanashôzu in Ise; Biwa-ike in Owari; Takaraga-ike, Sawano-ike in Yamashiro. **Kiushiu**: Imuta-ike, Nakahama of Lake Ikeda in Satsuma. (Pl. XVI, fig. 23)

Distr. Japan, Europe, N. America.

forma **minor** (WEST) LÜTKEM. in STRÖM Nyt. Mag. Naturv. **57**, 21, 1919; GRÖNBLAD Mem. Soc. Faun. Flor. Fenn. **10**, 267, 1934; PRESCOTT Pap. Mich. Acad. Sci. **21**, 136, 1936. — *Penium cucurbitinum* BISS. forma **minor** W. & G. S. WEST in Monogr. Brit. Desm. **1**, 94, 1904.

Cellulae minores. Long. $56-60\mu$, Lat. $26.6-28\mu$, Lat. isth. 22μ .

Hab. **Hondo**: Mt. Kurikoma in Ugo; Naga-numa of Mazawa in Uzen. (New to Japan) (Pl. XVI, fig. 8)

Distr. Thailand, Europe, U. S. A., Brazil.

Cosmarium Clevei (LUND.) LÜTKEM. in GRÖNBLAD Act. Soc. Faun. Flor. Fenn. **47**, 49, 1920; WEST & CARTER Monogr. Brit. Desm. **5**, 267, 1923. — *Penium Clevei* LUND. in Nov. Act. Regn. Soc. Upsal. **3**, VIII, 86, 1871; WEST Monogr. Brit. Desm. **1**, 87, 1904; HIRANO Act. Phytotax. Geobot. **12**, 86, 1943.

Cellulae mediocres, fusiforme-cylindricae, 3-3.5 longiores quam latae, paullo constrictae, sinu tenue depresso; semicellulae anguste pyramidato-ovatae, apicibus late rotundis; membrana subtiliter punctata sed granulata.

prope apicem; chromatophoris cum 3-4 laminis longitudinalibus et pyrenoidibus in unoquoque semicellula. Long. 67-112 μ , Lat. 28-43 μ , Lat. isth. 27-41 μ .

Hab. **Hokkaido**: Tôasa-numa in Iburi. **Hondo**: Hosonuma, Mt. Komagatake in Ugo; Ônuma in Uzen; Keshonuma, Izu-numa in Rikuzen; Nogiwano-kwannon-ike, Akaiyachi in Iwashiro; Oze-numa in Kôzuke; Daimon-pass, Inago of Kitamaki-mura, Lake Nakatsuna in Shinano; Shinohara-ike in Oomi. **Shikoku**: Shiramizu-pass near Matsuyama in Iyo. (Pl. XVI, fig. 22)

Distr. Japan, Europe, U. S. A., E. Africa.

Cosmarium cucurbita BRÉB. in RALFS Brit. Desm. 108, 1848; WEST Monogr. Brit. Desm. 3, 106, 1908; GRÖNBLAD Act. Soc. Faun. Flor. Fenn. 49, 43, 1921; KRIEGER Arch. Hydrobiol. suppl. 11, 174, 1932; TAYLOR Pap. Mich. Acad. Sci. 19, 252, 1934; OKADA Journ. Imp. Fish. Inst. 30, 164, 1934; HIRANO Act. Phytotax. Geobot. 12, 88, 1943.

Cellulae mediocres, subcylindricae, 2.5 longiores quam latae, levissime constrictae, sinu depresso; semicellulae subquadratae; marginibus lateralibus subparallelis, gradatim attenuatae versus apicem, apice truncato-rotundato; a vertice visae circulares; membrana punctata; chromatophoris axialibus cum pyrenoidibus centralibus in unoquoque semicellula. Long. 38-43 μ , Lat. 17-18 μ , Lat. isth. 15-16 μ .

Hab. **Hokkaido**: Kiritappu, Junsai-numa in Kushiro; Nikuru-numa in Kitami; Nopporo, Kamikoshi-ukishima, Mt. Daisetsu in Ishikari; Shizukari in Oshima. **Hondo**: Mt. Hakkoda, Mt. Hachimantai, Mt. Iwaki in Mutsu; Hirumo-numa, Megata, Mt. Komagatake in Ugo; Mt. Gassan, Hakuryu-ko, Sugigamine of Mt. Zawo, Hijiori-naga-numa in Uzen; Mt. Kurikoma, Mt. Iwate in Rikuchû; Mt. Bandai, Mt. Azuma in Iwashiro; Oze, Ômine-numa, Mt. Akagi in Kôzuke; Usagishima, Shimizudaira of Mt. Nasu, Senjôgahara in Shimotsuke; Shigakôgen, Kirigamine, Kamikôchi, Shiroma Tengunohara, Mt. Kazafuki, Mt. Sanpôgamine, Lake Kizaki, Ashinota-ike in Shinano; Takayachi of Mt. Myôko, Kôridonono-ike in Echigo; Sennin-ike, Kumono-taira, Kurobegoro-daira, Mt. Tateyama, Tarobei-daira in Etchû; Takashihara in Mikawa; Mt. Hira in Oomi; Kanashôzu, Ishigaki-ike, Jôdo-ike in Ise. **Kiushiu**: Bôgatsuru of Mt. Kujû, Yabakei in Bunzen; Koshiki-ike, Mt. Ôhatayama of Kirishima in Hiuga; Imuta-ike in Satsuma. (Pl. XVI, fig. 5, 6)

Distr. Japan, N. Kuriles, Mongolia, China, Sumatra, Borneo, Malay, whole Europe, Greenland, N. America, W. Indies, W. Africa.

forma **latior** WEST in Monogr. Brit. Desm. 3, 108, 1908.

Cellulae breviores. Long. 39μ , Lat. 21μ , Lat. isth. 19.6μ .

Hab. **Hondo**: Koke-numa in Ugo; Usagi-numa in Shimotsuke; Daimon-pass in Shinano. (New to Asia) (Pl. XVI, fig. 7)

Distr. British Isles.

Cosmarium parvulum BRÉB. in WEST Monogr. Brit. Desm. **3**, 110, 1908; ALLORGE Rev. Alg. **5**, 358, 1930; KRIEGER Arch. Hydrobiol. suppl. **11**, 181, 1932; Ber. Dtsch. Bot. Ges. **54**, 85, 1936; WHELDEN Nat. Mus. Canada Bull. **97**, 84, 1947.

Cellulae parvae, circiter duplo longiores quam latiores, levissime constrictae, sinu minute depresso; semicellulae angusto-truncato-pyramidatae, gradatim attenuatae ad apicem, marginibus lateralibus paullo convexis, apicibus truncato-rotundis; a vertice visae circulares; membrana glabra vel subtiliter punctata. Long. $20-22\mu$, Lat. $10.5-11\mu$, Lat. isth. 10μ .

Hab. **Hokkaido**: Kiritappu in Kushiro; Mt. Daisetsu, Kamikoshi-ukishima in Ishikari. **Hondo**: Benze-numa in Mutsu; Mt. Gassan in Uzen; Mt. Azuma in Iwashiro; Nanko in Iwaki; Ozegahara, M. Akagi in Kôzuke; Shigakôgen, Kirigamine, Happô-ridge, Tengunohara in Shinano; Mt. Naeba, Kurosawano-ike of Mt. Myôko in Echigo; Mt. Tateyama, Kumono-taira in Etchû. **Kiushiu**: Byakushi-ike, Ôhatayama of Mt. Kirishima in Hiuga. (Pl. XVI, fig. 3)

Distr. Japan, Sumatra, Ceylon, Malay, whole Europe, Nova zembla, Spitzbergen, Greenland, N. America, Brazil, Patagonia, Azores.

Cosmarium viride (CORDA) JOSH. in WEST Trans. Linn. Soc. Bot. **5**, 71, 1895; Monogr. Brit. Desm. **3**, 113, 1908; KRIEGER Arch. Hydrobiol. suppl. **11**, 190, 1932; TAYLOR Pap. Mich. Acad. Sci. **19**, 272, 1934; INSAM & KRIEGER Hedw. **76**, 111, 1937.

Gellulae modicae, subcylindricae, circiter duplo longiores quam latiores, modice et latissime retusae in medio; semicellulae obovato-subcirculares, angulis late rotundis et apice paullo recto; membrana punctata; a vertice visae circulares. Long. $53-56\mu$, Lat. 28μ , Lat. isth. $22-24\mu$.

Hab. **Hokkaido**: Tomakomai in Iburi. **Hondo**: Hizume in Rikuchû; Chûkawa-ike in Uzen: (New to Japan) (Pl. XVI, fig. 2)

Distr. India, Bali, Europe, N. America, E. Africa, Madagascar, Nova Scotia.

forma **minor** WEST in Monogr. Brit. Desm. **3**, 113, 1908.

Cellulae minores. Long. 28μ , Lat. 16.8μ , Lat. isth. 11.2μ .

Hab. **Hokkaido**: Tomakomai in Iburi. (New to Asia) (Pl. XVI, fig. 13)

Distr. British Isles.

Cosmarium globosum BULNH. in W. & G. S. WEST Monogr. Brit. Desm. **3**, 29, 1908; OKADA Journ. Imp. Fish. Inst. **30**, 166, 1934; INSAM & KRIEGER Hedw. **76**, 100, 1937.

Cellulae parvae, circiter 1.5 longiores quam latae, paullo constrictae, sinu late aperto ad apicem acutangulo; semicellulae subcirculares (circiter $\frac{3}{4}$ circulo); a vertice visae circulares; membrana punctata; chromatophoris axialibus cum pyrenoidibus centralibus in unoquoque semicellula. Long. 30–38.7 μ , Lat. 20–28 μ , Lat. isth. 19–26 μ .

Hab. Hokkaido: Mt. Daisetsu, Kamikoshi-ukishima, Horomui in Ishikari; Ko-numa, Junsai-numa in Oshima. **Hondo:** Mt. Hakkoda, Hachiman-numa of Mt. Hachimantai, Kurobo-numa in Mutsu; Nishi-numa, Ogata, Mt. Komagatake in Ugo; Mt. Kurikoma in Rikuchû; Ôishita, Mt. Azuma in Uzen; Akaiyachi in Iwashiro; Shimizu-daira of Mt. Nasu, Senjôgahara of Nikko in Shimotsuke; Oze in Kôzuke; Mt. Naeba, Kurosawano-ike, Takayachi of Mt. Myôko in Echigo; Mt. Eboshi, Kumono-taira, Kurobegoro-daira, Tateyama, Tarobei-daira, Gakino-tanbo in Etchû; Shigakôgen, Kirigamine, Mt. Kazafuki, Shirouma-tengunohara, Happô-ridge in Shinano; Takashihara in Mikawa; Ishigaki-ike, Jôdo-ike in Ise; Fuse-ike, Mt. Hira in Oomi; Takaraga-ike in Yamashiro. **Kiushiu:** Hirabaru of Yabakei in Bunzen; Nakahara-ike of Fukiagenohama in Satsuma; Byakushi-ike, Ôhatayama of Mt. Kirishima in Hiuga. (Pl. XVI, fig. 15, 16)

Distr. Japan, the Kuriles, Manchuria, China, Sumatra, Europe, Nova Zembla, Spitzbergen, Greenland, N. & S. America, E. Africa.

forma **minor** BOLDT in WEST Monogr. Brit. Desm. 3, 30 1908.

Forma minor, sed ceteris similis. Long. 16.8–27.4 μ , Lat. 10.6–16.7 μ , Lat. isth. 8.4–12.6 μ .

Hab. Hokkaido: Kiritappu in Kushiro; Shimoyûbetsu, Kutcharo-ponto in Kitami; Kamikoshi-ukishima, Horomui, Mt. Daisetsu in Ishikari; Shikaribetsu-woppoto in Tokachi. **Hondo:** Mt. Iwate, Mt. Kurikoma, Mt. Hachimantai in Rikuchû; Megata, Hirumo-numa in Ugo; Mt. Azuma, Hakuryuko, Mt. Gassan, Chûkawa-ike, Hijiori-naga-numa, Mazawano-naga-numa, Sugigamine of Mt. Zawo in Uzen; Izu-numa in Rikuzen; Numano-taira of Mt. Bandai, Kôriyama, Nogiwano-kwannon-ike in Iwashiro; Kashimachô, Nanko, Ojiroi, Hibushi-numa in Iwaki; Ômine-numa, Jiuemon-ike in Kôzuke; Shimizu-daira of Mt. Nasu, Senjôgahara of Nikko in Shimotsuke; Mt. Naeba, Kôridonono-ike, Kagami-ike of Matsunoyama in Echigo; Shigakôgen, Lake Nakatsuna, Kizaki, Ashinota-ike, Mt. Sanpôgamine, Karuisawa, Ôhanami-ike, Tsuga-daira, Shirouma-ôike, Happô-ridge, Mt. Kirigamine, Midori-ike in Shinano; Mt. Tateyama, Kurobegoro-dake, Ôniu-ike, Gono-ike of Mt. Norikura, Tarobei-daira in Etchû; Suhara-ike in Mikawa; Oike of Hichimenzan in Kai; Jôdo-ike in Ise; Fuse-ike in Oomi. (Pl. XVI, fig. 19)

Distr. Central China, Ireland, Greenland.

var. **subaltum** MESSIK. in Viertelj. Naturf. Ges. Zürich 80, 46, 1935; TAFT Ohio Journ. Sci. 45, 195, 1945.

In var. cellulae in medio non profundius constrictae, parum elongatae, granulis distinctibus. Long. 31μ , Lat. 19.7μ , Lat. isth. 16.8μ .

Hab. **Hondo**: Daimon-pass, Happô-ridge in Shinano. **Kiushiu**: Imuta-ike, Nakahama of Lake Ikeda in Satsuma. (Pl. XVI, fig. 14)

Distr. Japan, Switzerland, U. S. A.

var. **minus** HANSIG. in MIGNOLA Krypt. Fl. II, 414, 1907; WEST Monogr. Brit. Desm. 3, 39, 1908; SKVORTZOW Journ. Bot. 64, 127, 1926.

In var. cellulae minores; semicellulae nonnihil depressae, apicibus rectis vel convexis; membrana glabra. Long. $21-22.4\mu$, Lat. 15.4μ , Lat. isth. 9.8μ .

Hab. **Hondo**: Mt. Akagi in Kôzuke; Kurosawano-ike, Koyano-ike of Mt. Myôko in Echigo. (New to Japan) (Pl. XVI, fig. 18)

Distr. Manchuria, Europe, Spitzbergen, E. Africa.

Cosmarium pseudarctoum NORDST. in NORDSTEDT Alg. exsicc. 45, 1889; WEST Monogr. Brit. Desm. 3, 32, 1908; SKVORTZOW Phillip. Journ. Sci. 49, 151, 1932; TAFT Ohio Journ. Sci. 45, 198, 1945.

Cellulae parvae, circiter 1.5 longiores quam latae, modice constrictae, sinu aperto obtuso; semicellulae subcirculares vel late ovatae, apicibus leviter rectis; a vertice visae paene circulares; membrana glabra. Long. $16.8-26.6\mu$, Lat. $12-18\mu$, Lat. isth. $10.4-14\mu$.

Hab. **Hokkaido**: Tôro in Kushiro. **Hondo**: Inago of Kitamaki-mura in Shinano; Fuse-ike in Oomi; Mizoroga-ike in Yamashiro. (New to Japan) (Pl. XVI, fig. 9, 10)

Distr. Korea, Thailand, Europe, Greenland, U. S. A.

var. **perminutum** (G. S. WEST) STRÖM in Skrift Norsk. Vid. Akad. Oslo Math.-Nat. 6, 217, 1926; HIRANO Act. Phytotax. Geobot. 12, 160, 1943.

In var. cellulae minores, paene duplo longiores; semicellulae raro obverse ovatae, apicibus rotundis. Long. $9-13.4\mu$, Lat. $5.6-8.4\mu$, Lat. isth. $6-7\mu$.

Hab. **Hokkaido**: Tomakomai in Iburi. **Hondo**: Kurobo-numa in Mutsu; Kazafuki-Kaminota in Shinano; Kojoro-ike of Mt. Hira in Oomi; Jôdo-ike in Ise. (Pl. XVI, fig. 11)

Distr. Japan, Norway.

var. **colorum** HIRANO in Act. Phytotax. Geobot. 14, 71, 1951.

Membrana rufescens et glabra. Long. 16.8μ , Lat. 10.4μ , Lat. isth. 9.8μ .

Hab. **Hondo**: Akaiyachi in Iwashiro. (Pl. XVI, fig. 12)

Distr. Japan.

Cosmarium curtum (BRÉB.) RALFS in Brit. Desm. 109, 1848; CARTER Ann. Bot. 34, 270, 1920; WEST & CARTER Monogr. Brit. Desm. 5, 261, 267, 1923; INSAM & KRIEGER Hedw. 76, 99, 1937. — *Penium curtum* BRÉB. in Ofv. K. Vet. Akad. Förh. 15, 1875; WEST Monogr. Brit. Desm. 1, 97, 1904; MIGULA Krypt. Fl. 2, 369, 1907; OKADA Bot. Mag. 50, 314, 1936.

Cellulae parvae, circiter duplo longiores quam latiores, paullo constrictae, sinu aperto et depresso; semicellulae subovatae, apicibus parum rectis angustis; a vertice visae circulares; membrana punctata. Long. 32–43 μ , Lat. 19.6–22.8 μ , Lat. isth. 18.3–21.5 μ .

Hab. **Hondo**: Kotsutsumi-nishi-ike in Mikawa; Jôdo-ike in Ise; Ogura (OKADA), Mizoroga-ike, Ko-ike in Yamashiro. **Kiushiu**: Miyazaki in Hiuga; Ahira in Ôsumi; Nakahama of Lake Ikeda in Satsuma. (Pl. XVI, fig. 20)

Distr. Japan, Siberia, India, Burma, Thailand, Borneo, Europe, Nova Zembla, Greenland, Spitzbergen, N. America, Graham's land, W. Indies.

Cosmarium subturgidum (TURNER) SCHMIDLE in WEST Monogr. Brit. Desm. 3, 116, 1908. — *Dysphinctium subturgidum* TURNER in K. Sv. Vet. Akad. Handl. 25, 43, 1893.

Cellulae permagnae, circiter 1 $\frac{3}{4}$ longiores quam latae, levissime constrictae, sinu aperto vadoso-depresso; semicellulae ovatae; membrana subtiliter punctata; a vertice visae circulares. Long. 134–168 μ , Lat. 81–95 μ , Lat. isth. 54–90 μ .

Hab. **Hokkaido**: Akan Junsai-numa in Kushiro. **Hondo**: Kashima-chô in Iwaki. (New to Japan) (Pl. XVI, fig. 25)

Distr. Manchuria, China, India.

forma **minor** SCHMIDLE in WEST Monogr. Brit. Desm. 3, 117, 1908; KRIEGER Arch. Hydrobiol. suppl. 11, 188, 1932; FUJISAWA Journ. Jap. Bot. 10, 444, 1934.

Forma minor, minus constricta, apicibus semicellularum leviter latioribus; chromatophoris parietalibus in laminis longitudinalibus 4–5 et pyrenoidi nonnulli in unaquaque semicellula. Long. 76–112 μ , Lat. 50–60 μ , Lat. isth. 48–56 μ .

Hab. **Hokkaido**: Shizukari in Oshima. **Hondo**: Kurobo-numa, Kyutai in Mutsu; Hirumo-numa, Megata, Moritake-ôtsutsumi in Ugo; Kaibai-ike, Ôishita in Uzen; Kesho-numa in Rikuzen; Umaushi-numa, Nanko, Kashima-chô in Iwaki; Nogiwano-kwannon-ike in Iwashiro; Ozegahara, Mt. Akagi in Kôzuke; Karuisawa in Shinano; Kotsutsumi-nishi-ike in Mikawa; Ishigaki-ike, Kanashôzu, Tamaru in Ise; Fuse-ike, Mt. Hira in Oomi; Mizoroga-ike, Ko-ike, Sawano-ike in Yamashiro. **Shikoku**: Matsuyama in Iyo; Yamada in Tosa. **Kiushiu**: Hirabaru of Yabakei in Bunzen; Imuta-ike, Nakahama of Lake Ikeda in Satsuma. (Pl. XVI, fig. 26)

Distr. Japan, Kôtôsho near Formosa, China, Samoa, Australia, Thailand, Sumatra, Ireland, E. Africa.

Cosmarium australe (RACIB.) LÜTKEM. in WEST Journ. Linn. Soc. Bot. 33, 157, 1897.

Cellulae mediocres, circiter 1.5 longiores quam latae, levissime constrictae, sinu depresso; semicellulae semiellipticae, marginibus lateralibus convexis leniter convergentibus, apicibus leviter rectis; a vertice visae circulares; membrana minute punctata; chromatophoris axialibus cum pyrenoidibus unoquoque semicellula. Long. 67-73 μ , Lat. 41-45 μ , Lat. isth. 39-41 μ .

Hab. **Hokkaido**: Chôbushi-numa, Okineppe in Nemuro; Akan Junsai-numa, Tokotan in Kushiro; Horomui in Ishikari; Sarufutsu, Shimoyûbetsu in Kitami; Shiraoi-poroto-numa, Yûfutsu in Iburi. **Hondo**: Nagatai of north foot of Mt. Iwaki in Mutsu; Izu-numa in Rikuzen; Hijiori-naga-numa, Hakyryu-ko in Uzen; Hôzawa-ike in Iwashiro; Kagami-ike of Matsunoyama, Kanatsuka-mura in Echigo; Inago of Kitamaki-mura, Ôhanami-ike in Shinano; Fuse-ike, Nukigawa, Shinohara-ike in Oomi. (New to Japan) (Pl. XV, fig. 7, 8)

Distr. Malay.

Cosmarium alpestre ROY & BISSET in WEST Monogr. Brit. Desm. 3, 24, 1908; ALLORGE Rev. Alg. 5, 352, 1930; TAYLOR Pap. Mich. Acad. Sci. 19, 250, 1934; OKADA Bot. Mag. 50, 256, 1936; PRESCOTT & SCOTT Trans. Amer. Micr. Soc. 61, 12, 1942.

Cellulae modicae vel submagnae, circiter 1½ longiores quam latae, levissime constrictae, sinu depresso; semicellulae subcirculares, apicibus aliquando leviter rectis; membrana subtiliter et confertim punctata; a vertice visae late ellipticae; a latere visae subcirculares. Long. 67-76 μ , Lat. 50-62 μ , Lat. isth. 49-56 μ .

Hab. **Hokkaido**: Horomui in Ishikari. **Hondo**: Kurobo-numa in Mutsu; Koke-numa in Ugo; Daimon-pass in Shinano; Kakumanbuchi of Mt. Akagi (OKADA) in Kôzuke; Ishigaki-ike in Ise. (Pl. XV, fig. 13-15)

Distr. Europe, N. America.

Cosmarium alpestre in our country is smaller than the WEST's dimension, but cell outline is similar to the WEST's figure; however in details our form is somewhat different from the European form by having an almost circular vertical view and narrow apex. The cell wall is distinctly scrobiculated and is finely punctated between the scrobiculations.

Sect. **Eudysphinctium** HIRANO, sect. nov.

Dysphinctium subgen. *Dysphinctium* NÄG. in Gatt. einz. Alg. 111, 1849. — *Cosmarium* sect.

Dysphinctium (NÄG.) DeBARY in Conj. 72, 1858. — *Dysphinctium* subgen. *Sphaerosphinctium* TURNER in K. Sv. Vet. Akad. Handl. 25, 44, 1893. — *Cosmarium* sect. *Globuliferae* CEDERGREN in Ark. Bot. 25A:4, 48, 1933 (pro parte)

Cellulae elongatae, conspicue constrictae, sinu aperto; semicellulae globosae, ovaes vel ellipticae.

- 1a. Cellulae magnae, elongatae, $2-2\frac{1}{2}$ longiores quam latiores, $150-220\mu$ in longitudinem **C. turgidum**
- 2a. Apice lato, marginibus lateralibus paene rectis f. **typica**
- 2b. Apice angusto, marginibus lateralibus convexis var. **ovatum**
- 1b. Cellulae modicae, $1\frac{1}{2}$ longiores quam latiores, $65-100\mu$ in longitudinem **C. connatum**
- 1c. Cellulae parvae, $1\frac{1}{4}-1\frac{3}{4}$ longiores quam latiores, $18-51\mu$ in longitudinem.
- 2a. Membrana glabra vel punctata, punctulis irregularibus.
- 3a. Semicellulae circulares vel subcirculares **C. moniliforme**
- 4a. Sinu acuto.
- 5a. Membrana glabra f. **typica**
- 5b. Membrana punctata f. **punctata**
- 4b. Sinu rotundo f. **pandriforme**
- 3b. Semicellulae ellipticae.
- 4a. Semicellulae transverse ellipticae f. **elliptica**
- 4b. Semicellulae vertice ellipticae var. **elongata**
- 3b. Semicellulae subpyriformes var. **subpyriforme**
- 2b. Membrana cum serie transversalium punctorum ordinata.
- 3a. Cellulae ovatae, sinu acute aperto **C. zonatum**
- 3b. Cellulae subquadratae, sinu anguste lineari, apice cum plicationibus ordinato **C. binerve**

Cosmarium turgidum BRÉB. in ROY & BISSET Journ. Bot. 24, 196, 1886; WEST Monogr. Brit. Desm. 3, 115, 1908; KRIEGER Arch. Hydrobiol. suppl. 11, 189, 1932.

Cellulae magnae, circiter $2-2\frac{1}{2}$ longiores quam latae, modice constrictae, sinu late aperto in vertice rotundato; semicellulae ovatae, marginibus lateralibus leviter convexis convergentibus, angulis apicalibus bene rotundis, apicibus angustis convexis; a vertice visae circulares; membrana subtiliter scrobiculata. Long. $165-215\mu$, Lat. $75-86\mu$, Lat. isth. $58-77\mu$.

Hab. **Hokkaido**: Akan Jnnsai-numa, Tokotan in Kushiro; Shimoyûbetsu in Kitami; Minenobu in Ishikari; Shiraoi-poruto-numa, Yûfutsu in Iburi; Shizukari in Oshima. **Hondo**: Aka-numa in Ugo; Kashima-chô in Iwaki; Kagami-ike of Matsunoyama in Echigo; Inago of Kitamaki-mura in Shinano. (Pl. XVII, fig. 15)

Distr. Java, Sumatra. New Caledonia, Australia, New Zealand, Europe.

var. **ovatum** NORDST. in K. Sv. Vet. Akad. Handl. 22, 63, 1888. — var. *Koreana* SKVORTZOW in Phillip. Journ. Sci. 49, 152, 1932. — var. *ligatum* W. & G. S. WEST in Ann. Roy. Bot. Gard. Calcutta 6, 204, 1907.

Cellulae permagnae, modice constrictae, sinu aperto ad verticem rectan-

gulari-rotundato; semicellulae elongato-ovatae vel elongato-ellipticae, apicibus late rotundis; membrana distincte punctata; a vertice visae circulares. Long. 154-199 μ , Lat. 67-77 μ , Lat. isth. 42-45 μ .

Hab. **Hondo**: Akaiyachi in Iwashiro; Kotsutsumi-nishi-ike in Mikawa; Shinohara-ike, Oku-ike of Higashikusano-mura in Oomi; Takaraga-ike, Mizoroga-ike in Yamashiro. (New to Japan) (Pl. XVII, fig. 9, 16)

Distr. Korea, Burma, New Zealand, Austria.

I have two forms of *C. turgidum* var. *ovatum* and f. *Koreana* from Mizoroga-ike and Takaraga-ike, Kyoto. The one quite coincides with an original description from New Zealand given by NORDSTEDT and another coincides with the Korean form given by SKVORTZOW however in the same place the size and form of semicell is fairly variable and sometime is elongate-ovate and sometimes is elongate and elliptic. The cell wall of both forms is densely and distinctly punctated. Therefore I consider them as a same variety.

Cosmarium connatum BRÉB. in RALFS Brit. Desm. 108, 1848; ROY & BISSET Journ. Bot. 24, 196, 1886; WEST Monogr. Brit. Desm. 3, 25, 1908; KRIEGER Arch. Hydrobiol. suppl. 11, 173, 1932; OKADA Bull. Biogeogr. Soc. Jap. 3, 47, 1932; TAYLOR Pap. Mich. Acad. Sci. 19, 251, 1934.

Cellulae submagnae, $1\frac{1}{3}$ longiores quam latae, modice constrictae, sinu late aperto extremo obtuso; semicellulae transverse ellipticae, apicibus late rotundis vel leviter rectis; a vertice visae subcirculares, leviter compressae; membrana paullo crassata, fine scrobiculata et dense punctata inter scrobiculos; semicellulae cum duabus pyrenoidibus. Long. 62-87 μ , Lat. 45-70 μ , Lat. isth. 37-53 μ .

Hab. **Hokkaido**: Chôbushi-numa in Nemuro; Kiritappu, Tokotan in Kushiro; Nikuru-numa, Notoro-ponto, Sarufutsu in Kitami; Toyokorokonuma in Tokachi; Nakano near Sapporo, Horomui in Ishikari; Tomakomai, Yûfutsu, Numanohata in Iburi; Shizukari in Oshima. **Hondo**: Hizume in Rikuchû; Mt. Komagatake, Megata in Ugo; Izu-numa, Naga-numa in Rikuzen; Hakuryu-ko, Chûkawa-ike in Uzen; Akaiyachi, Kôriyama, Nogiwanokwannon-ike in Iwashiro; Kashima-chô, Ojiroi, Hibushi-numa in Iwaki; Mt. Akagi, Oze in Kôzuke; Kagami-ike of Matsunoyama in Echigo; Daimonpass, Kirigamine, Happô-ridge, Kamikôchi, Kanori-ike, moor near Lake Kizaki in Shinano; Tanuki-numa in Suruga; Kanashôzu in Ise; Nukigawa, Mt. Hira in Oomi; Ariga-ike in Yamashiro. **Shikoku**: Yamada in Tosa. **Kiushiu**: Ahira in Ôsumi; Nakahama of Lake Ikeda in Satsuma. (Pl. XVI, fig. 17, Pl. XVII, fig. 8)

Distr. Japan, Kô tô sho near Formosa, China, Burma, India, Java, Sumatra, Europe, N. America, Guiana, Brazil, central Africa.

Cosmarium moniliforme (TURP.) RALFS in Brit. Desm. 107, 1848; LUNDELL Nov. Act. Regn. Soc. Ups. ser. 3, VIII, 44, 1871; ROY & BISSET Journ. Bot. 24, 196, 1886; WEST Monogr. Brit. Desm. 3, 20, 1908; OKADA Bull. Biogeogr. Soc. Jap. 3, 49, 1932; TAYLOR Pap. Mich. Acad. Sci. 19, 258, 1934; INSAM & KRIEGER Hedw. 76, 102, 1937.

Cellulae submediocres, circiter duplo longiores quam latiores, profunde constrictae, sinu late aperto ad verticem angusto; semicellulae circulares vel subcirculares; a latere et vertice visae circulares; membrana glabra; chromatophoris cum pyrenoidibus in unoquoque semicellula. Long. 29.4–56 μ , Lat. 15–29 μ , Lat. isth. 4.2–11 μ .

Hab. **Hokkaido**: Kiritappu in Kushiro; Sarufutsu in Kitami; Toyokoro in Tokachi; Mt. Daisetsu, Kamikoshi-ukishima, Minenobu in Ishikari; Yûfutsu in Iburi; Shizukari in Oshima. **Hondo**: Koke-numa, Aka-numa in Ugo; Hizume in Rikuchû; Hijiori-naga-numa, Ôishita in Uzen; Nogiwanokwannon-ike, Akaiyachi in Iwashiro; Kotsutsumi-nishi-ike in Mikawa; Tamaru, Ishigaki-ike, Kanashôzu in Ise; Matsubara-naiko, Fuse-ike in Oomi; Mizoroga-ike, Rokujizô in Yamashiro. (Pl. XVII, fig. 6)

Distr. Japan, Manchuria, central China, Kôtôsho near Formosa, India, Ceylon, Burma, Europe, N. & S. America, Australia, Madagascar.

forma **punctata** LAGERH. in WEST Trans. Linn. Soc. Bot. 5, 70, 1895; Monogr. Brit. Desm. 3, 22, 1908; TAFT Ohio Journ. Sci. 45, 196, 1945; HIRANO Bot. Mag. 66, 132, 1953.

Cellula distincte punctata. Long. 31–33.6 μ , Lat. 17–21 μ , Lat. isth. 7.3–8.4 μ .

Hab. **Hondo**: Happô-ridge in Shinano; Takayachi of Mt. Myôko in Echigo. (Pl. XVII, fig. 7)

Distr. British Isles, N. America, Madagascar.

forma **pandriiforme** HEIMERL in Trans. Roy. Soc. Edinburgh 41, 499, 1905; Monogr. Brit. Desm. 3, 22, 1908; BERGE Ark. Bot. 18, 9, 1923; SKVORTZOW Phillip. Journ. Sci. 49, 151, 1932; KRIEGER Arch. Hydrobiol. suppl. 11, 180, 1932; INSAM & KRIEGER Hedw. 76, 102, 1937.

Cellulae minores, non profundius constrictae, sinu semicirculari. Long. 19.6–25 μ , Lat. 11–14 μ , Lat. isth. 9–9.8 μ .

Hab. **Hokkaido**: Horomui in Ishikari; Yûfutsu in Iburi; Shizukari, Ko-numa in Oshima. **Hondo**: Chûkawa-ike in Uzen; Izu-numa in Rikuzen; Goda-numa in Shimofusa; Mizoroga-ike in Yamashiro; Ikejiri-ike in Tanba. **Shikoku**: Yamada in Tosa. (New to Japan) (Pl. XVII, fig. 3)

Distr. Manchuria, Sumatra, Europe, Canada, Australia.

forma **elliptica** LAGERH. in KRIEGER Arch. Hydrobiol. suppl. 11, 179, 1932; HIRANO Act. Phytotax. Geobot. 12, 94, 1943.

Cellulae maiores et ellipticae. Long. 50 μ , Lat. 32 μ , Lat. isth. 11 μ .

Hab. **Hondo**: Ozegahara in Kôzuke; Shigakôgen in Shinano. **Kiushiu**: Nakahara-ike of Fukiagenohama in Satsuma. (Pl. XVII, fig. 4)

Distr. Japan, Sumatra.

forma **elongata** W. & G. S. WEST in Journ. Linn. Soc. Bot. **33**, 311, 1898; Monogr. Brit. Desm. **3**, 23, 1908.

Semicellulae aliquantum ellipticae, circiter $2\frac{1}{4}$ longiores quam latiores. Long. $39-41\mu$, Lat. $18-22\mu$, Lat. isth. $6.5-7\mu$.

Hab. **Hondo**: Hirumo-numa in Ugo; Kotsutsumi-nishi-ike in Mikawa; Takaraga-ike in Yamashiro. (New to Asia) (Pl. XVII, fig. 5)

Distr. British Isles, U. S. A.

var. **subpyriforme** W. & G. S. WEST in Monogr. Brit. Desm. **3**, 23, 1908; KRIEGER Arch. Hydrobiol. suppl. **11**, 180, 1932; TAFT Ohio Journ. Sci. **45**, 196, 1945.

Semicellulae obverse truncato-ovatae, apicibus leviter rectis, angulis apicalibus bene rotundis. Long. $34-56\mu$, Lat. $21-23\mu$, Lat. isth. $6.4-9.5\mu$.

Hab. **Hondo**: Koke-numa, Moritake-ôtsutsumi in Ugo; Takaraga-ike in Yamashiro. (New to Japan) (Pl. XVII, fig. 10)

Distr. Sumatra, British Isles, U. S. A.

Cosmarium zonatum LUND. in Nov. Act. Reg. Soc. Ups. **3**, VIII, 50, 1871; WEST Monogr. Brit. Desm. **3**, 123, 1908; GRÖNBLAD Act. Soc. Faun. Flor. Fenn. **47**, 50, 1920; OKADA Bot. Mag. **50**, 83, 1936; INSAM & KRIEGER Hedw. **76**, 111, 1937.

Cellulae submediocres, circiter duplo longiores quam latiores, profunde constrictae, sinu aperto acutangulo; semicellulae subovatae, gradatim attenuatae ad apicem, apicibus rotundis; a latere visae ovatae; a vertice visae paene circulares vel elliptico-circulares; membrana glabra et serie transversa quinque punctulorum trans semicellulam ordinata, idest series simplex sub apice, series adamussim supra dimidium, series duplex a parte latiore semicellulae et series alia adamussim supra isthmum. Long. $34.4-50.4\mu$, Lat. $22.4-25.2\mu$, Lat. isth. $7-9.8\mu$.

Hab. **Hokkaido**: Akan Junsai-numa, Kiritappu in Kushiro; Toyokoro in Tokachi; Tomakomai, Tôasa-numa in Iburî; Shizukari in Oshima. **Hondo**: Benze-numa in Mutsu; Koke-numa, Moritake-ôtsutsumi in Ugo; Hizume in Rikuchû; Ôishitano-junsaitsumi in Uzen; Kirifushi-numa in Rikuzen; Akai, Nogiwano-kwannon-ike in Iwashiro; Ômine-numa, Oze in Kôzuke; Daimon-pass, Inago of Kitamaki-mura, Lake Nakatsuna, Mt. Kirigamine in Shinano; Mizoroga-ike, Takaraga-ike in Yamashiro. **Kiushiu**: Nakahama of Lake Ikeda in Satsuma. (Pl. XVII, fig. 2)

Distr. Japan, Ceylon, Europe.

The species is somewhat similar to *Cosmarium binerve* in the shape of

form and in its punctations but is distinguished by the possession of straight or slightly convex lateral margin (*Cosmarium binerve* is slightly retuse) and by the destitute of apical ridges. The distribution of this species is fairly wide and is frequently found in the peaty bogs or marshes in central and northern Japan, but is rather rare in western Japan while *Cosmarium binerve* is rare and I have only found it in one locality.

Cosmarium binerve LUND. in Nov. Act. Reg. Soc. Ups. 3, VIII, 49, 1871; WEST Monogr. Brit. Desm. 3, 123, 1908.

Cellulae submediocres, elongatae, duplo longiores quam latiores vel leviter longiores, profunde constrictae, sinu angusto-lineari extremo leviter dilatato; semicellulae anguste truncato-pyramidatae, angulis basalibus rectangulari-rotundis et leviter prominentibus, marginibus lateralibus paene rectis sed leviter retusis prope inflationem basis, marginibus lateralibus superioribus leviter convergentibus, angulis apicalibus bene rotundis, apicibus leviter convexis; membrana glabra et serie transversa quaterna punctulorum instructa, cum serie dupla ad basim, et serie in medio serieque infra apicem; a latere visae subellipticae, lamina singula ad angulos apicales utrobique infra apicem leviter obliqualibus instructa; a vertice visae circulares, lamina duabus parva curva instructa. Long. 47μ , Lat. 22μ , Lat. isth. 8μ .

Distr. **Hondo**: Koke-numa in Ugo. (New to Asia) (Pl. XVII, fig. 1)

Cosmarium binerve from Koke-numa does not exactly coincide with the British form by the slightly attenuated semicell and the manner of punctations, series of punctations are horizontal instead of arcuate serie of British form and four series are visible on the face of semicell. *Cosmarium binerve* is not common as *Cosmarium zonatum* in Japan, and in Koke-numa it is associated with *Cosmarium zonatum*.

Sect. **Calocylindrus** NÄG. emend. HIRANO

Dysphinctium subgen. *Calocylindrus* NÄG. in Gatt. einz. Alg. 110, 1849. (pro parte) — *Cosmarium* sect. *Kylindroides* CEDERGREN in Ark. Bot. 25A: 4, 61, 1933.

Cellulae elongatae, cylindricae vel subcylindricae, circiter duplo longiores quam latae, paullo constrictae, sinu aperto depresso.

1a. Cellulae parvae vel modicae, $42-88\mu$ in longitudinem.

2a. Cellulae cum serie regularibus granulorum ordinatae.

3a. Granula distincta et rotunda **C. amoenum**

4a. Granula in serie longitudinali et horizontali ordinata **f. typica**

4b. Granula in serie obliqua ordinata **var. alternans.**

- 3b. Granula plana et indistincta, in serie radiali ordinata.
 - 4a. Semicellulae cum zona granulorum magnorum ad basim ordinatae, pyrenoidibus 2 in unaquaque semicellula **C. nipponicum**
 - 4b. Semicellulae cum serie granulorum dupla ad basim ordinatae, pyrenoidibus 1 in unaquaque semicellula **C. pseudamoenum**
- 2b. Cellulae cum serie regulari verrucarum emarginatarum ordinatae.
 - 3a. Sinu modice profundo **C. elegantissimum**
 - 4a. Cellulae 80-88 μ in longitudinem f. **typica**
 - 4b. Cellulae 49-54 μ in longitudinem f. **minor**
 - 3b. Sinu vadoso, verrucae planae var. **simplicius**
- 1b. Cellulae magnae, 133-155 μ in longitudinem **C. striolatum**
 - 2a. Semicellulae subellipticae, granulis in serie horizontali et obliqua ordinatis f. **typica**
 - 2b. Semicellulae circulares, granulis in serie verticali et obliqua ordinatis var. **Nordstedtii**

Cosmarium amoenum BRÉB. in RALFS Brit. Desm. 102, 1848; WEST Monogr. Brit. Desm. 4, 29, 1911; SMITH Wisc. Bull. 57, 32, 1924; TAYLOR Pap. Mich. Acad. Sci. 19, 250, 1934; OKADA in ASAHINA'S Inkwa. 169, 1939; HIRANO Act. Phytotax. Geobot. 12, 82, 1943.

Cellulae raro parvae, circiter duplo longiores quam latiores, modice constrictae, sinu aperto acutangulo; semicellulae subquadratae, marginibus lateralibus subparallelis et leviter convexis, angulis apicalibus late rotundis, apicibus convexis; membrana granulata, granulis in seriebus verticalibus praesentim trans basim (7-8 seriebus) et granulis circ. 17 in toto ambitu marginis praeditis; a latere visae ovato-oblongae vel subelliptico-oblongae; a vertice visae ellipticae; chromatophoris axialibus cum duobus pyrenoidibus. Long. 42-67 μ , Lat. 22-28 μ , Lat. isth. 13-21 μ .

Hab. **Hokkaido**: Tôro in Kushiro; Nikuru-numa, Sarufutsu in Kitami; Nopporo, Mt. Daisetsu, Kamikoshi-ukishima in Ishikari; Shizukari in Oshima; **Hondo**: Mt. Hakkoda, Hachiman-numa, Kurobo-numa in Mutsu; Hachimantai, Hizume in Rikuchû; Hoso-numa, Koke-numa, Mt. Komagatake, Mt. Kurikoma, Moritake-ôtsutsumi in Ugo; Izu-numa in Rikuzen; Ôishita, Hijiori-naga-numa in Uzen; Nogiwano-kwannon-ike, Akai in Iwashiro; Kashima-chô in Iwaki; Mt. Akagi, Oze, Ômine-numa in Kôzuke; Gôno-ike in Hitachi; Kôridonono-ike in Echigo; Daimon-pass, Kirigamine, Inago of Kitamaki-mura, Happô-ridge, Kamikôchi, Ôhanami-ike, Kanori-ike in Shinano; Gakinotanbo in Etchû; Tanuki-numa in Suruga; Nukigawa, Shinohara-ike, Matsubara-naiko, Mt. Hira, Fuse-ike in Oomi; Mizoroga-ike in Yamashiro. **Kiushiu**: Ahira in Ôsumi. (Pl. XVIII, fig. 3)

Distr. Japan, Ceylon, Europe, Greenland, N. America, Brazil.

var. **alternans** HIRANO, var. nov.

Semicellulae rotundo-subquadratae, sinu acuto acutangulo et acuminato

ad apicem; membrana granulata, granulis in seriebus obliqualibus ordinatis. Long. 44.8μ , Lat. 23.8μ , Lat. isth. 15.4μ .

Hab. **Hondo**: Onigaizumi of Kirigamine in Shinano. (Pl. XVIII, fig. 4)

Cosmarium nipponicum HIRANO in Act. Phytotax. Geobot. 12, 94, 1943.

Cellulae parvae, cylindricae, circiter duplo longiores quam latiores, modice constrictae, sinu aperto et subrectangulari; semicellulae subquadratae, margine granulato-undulatae, angulis superioribus et inferioribus rotundatis, apicibus leviter convexis in margine, lateribus parallelis, granulato-undulatis, in parte inferiori maiores quam in superiori vel duplo crenatis; membrana granulata, regulariter ordinata in parte marginum et apicum, in parte basis granulis in zona horizontali ordinatis; a vertice visae circulares vel subcirculares non ellipticae, granulis concentricè ordinatis; pyrenoidibus binis in unoquoque semicellula Long. $37.8-42\mu$, Lat. 18μ , Lat. isth. 12.6μ .

Hab. **Hokkaido**: Kiritappu in Kushiro. **Hondo**: Kotsutsumi in Mutsu; Koke-numa, Hirumo-numa, Moritake-ôtsutsumi, Kariwano in Ugo; Hizume in Rikuchû; Ôishita Hijiori-naga-numa, Mazawano-naga-numa, Hakuryu-ko in Uzen; Nogiwano-kwannon-ike, Numano-taira of Mt. Bandai in Iwashiro; Kashima-chô, Nanko in Iwaki; Ômine-numa, Ozegahara in Kôzuke; Kana-zuka-mura in Echigo; Ashinota-ike, Ôhanami-ike, Kanori-ike, Kirigamine in Shinano; Ô-numa in Mikawa; Tamaru, Jôdo-ike in Ise; Fuse-ike, Shinohara-ike in Oomi. **Kiushiu**: Imuta-ike in Satsuma. (Pl. XVIII, fig. 6)

Distr. Japan.

Cosmarium pseudamoenum WILLE in Bih. K. Sv. Vet. Akad. Handl. 8, 18, 1884; MIGULA Krypt. Fl. II, 448, 1907; WEST Monogr. Brit. Desm. 4, 31, 1911.

Cellulae parvae, cylindricae, circiter duplo longiores quam latiores, modice constrictae, sinu aperto acutangulo; semicellulae oblongae, marginibus lateralibus paene parallelis vel leviter convexis cum angulis basalibus rotundis, apicibus quoque late rotundis, marginibus in toto ambitu undulato-granulatis, granulis reductis per depressiones in seriebus horizontalibus in parte inferiore et leviter irregulariter vel oblique in parte superiore ordinatis; a vertice visae circulares. Long. 40μ , Lat. 21μ , Lat. isth. 12.6μ .

Hab. **Hokkaido**: Tokotan-numa in Kushiro; Numanohata in Iburi. **Hondo**: Bora-numa in Mutsu; Kesho-numa in Rikuzen; Akai in Iwashiro; Oze in Kôzuke; Takaraga-ike in Yamashiro. **Kiushiu**: Miyazaki in Hiuga; Imuta-ike in Satsuma. (Pl. XVIII, fig. 5)

Distr. Japan, central China, Burma, Europe, U. S. A., Brazil, E. Africa.

Cosmarium elegantissimum LUND. in Nov. Act. Regn. Soc. Ups. 3, VIII, 53, 1871;

JOHNSON Bull. Torrey Bot. Club **22**, 292, 1895; WEST Monogr. Brit. Desm. **4**, 40, 1911; ALLORGE Rev. Alg. **5**, 356, 1930.

Cellulae submediocres, cylindricae, circiter $2\frac{1}{4}$ - $2\frac{1}{3}$ longiores quam latae, levissime constrictae, sinu aperto excavato; semicellulae semicirculares in parte superiore, partibus basalibus rectangularibus, marginibus lateralibus inferioribus rectis parallelis, angulis apicalibus late rotundis, apicibus angustis convexis; membrana regulariter verrucosa, verrucis emarginatis in serie horizontalibus et verticalibus ordinatis, circa seriem 8-9 trans basim; a vertice visae circulares, undulis parvis circa 22 in toto ambitu marginis. Long. 70μ , Lat. 31μ , Lat. isth. 25μ .

Hab. **Hokkaido**: Tomakomai, Yûfutsu in Iburi; Shizukari in Oshima. **Hondo**: Inago of Kitamaki-mura in Shinano. (New to Japan) (Pl. XVIII, fig. 7) Distr. Burma, Europe, U. S. A.

forma **minor** WEST in Monogr. Brit. Desm. **4**, 41, 1911; DICK Bot. Arch. **3**, 219, 1923; INSAM & KRIEGER Hedw. **76**, 100, 1937.

Cellulae minores. Long. 58 - 64μ , Lat. 25 - 29μ , Lat. isthm. 19.6 - 25μ .

Hab. **Hondo**: Nanko in Iwaki. (New to Japan) (Pl. XVIII, fig. 8)

Distr. China, Europe, Canada, Uruguay.

var. **simplicius** WEST in Journ. Linn. Soc. Bot. **33**, 308, 1898; BORGE Ark. Bot. **15**, 24, 1918; STRÖM Naturw. Unters. Sarek Gebirg. **3**, 485, 1923; INSAM & KRIEGER Hedw. **76**, 100, 1937.

Cellulae parvae, circiter duplo longiores quam latiores, constrictione paullo depressae, granulis raro parvis nonnihil inflatis, in 9-10 seriebus verticalibus ornatis. Long. 53 - 59μ , Lat. 24 - 26.6μ , Lat. isth. 22 - 22.5μ .

Hab. **Hokkaido**: Kiritappu in Kushiro. **Hondo**: Kurobo-numa in Mutsu; Mazawano-naga-numa, Hijiori-ônuma in Uzen; Lake Nakatsuna in Shinano. (New to Asia) (Pl. XVIII, fig. 9)

Distr. Sweden, U. S. A., Brazil.

Cosmarium elegantissimum is allied to the *Cosmarium amoenum*, *Cosm. mansangense* but is distinguished from them by the granulated cell wall. The form from Inago, Shinano province is somewhat smaller than the European forms. JOHNSON has already recorded a small form of this species from North America (Length 50μ , Breadth 22μ) but our form is larger than his dimension.

Cosmarium striolatum NÄG. in ROY & BISSET Journ. Bot. **24**, 196, 1886; HOMFELD Pflanzenf. **12**, 55, 1929; KRIEGER Arch. Hydrobiol. suppl. **1**, 186, 1932. — *Dysphinctium striolatum* NÄG. in Gatt. einz. Alg. **112**, 1849. — *Cosmarium tessellatum* NORDST. in Johnson Bull. Torrey Bot. Club **21**, 288, 1894; SCHULZ Bot. Arch. **2**, 135, 1922.

Cellulae magnae, cylindricae, circiter duplo longiores quam latiores, modice constrictae, sinu aperto in vertice rotundo; semicellulae subquadratae, marginibus lateralibus leviter convexis paene parallelis in parte inferiore, angulis apicalibus bene rotundis, apicibus convexis; membrana granulata, granulis magnis in seriebus transversalibus et verticalibus ornatis, seriebus 14-15 verticalibus trans semicellulam, inter granulos scrobiculis ornatis; a vertice visae circulares. Long. 138-155 μ , Lat. 62-82 μ , Lat. isth. 48-59 μ .

Hab. **Hokkaido**: Toyokoro in Tokachi; Yûfutsu, Numanohata, Tomakomai in Iburi. **Hondo**: Oze-numa in Kôzuke; Karuisawa, Inago of Kitamaki-mura in Shinano; Mizoroga-ike in Yamashiro. **Kiushiu**: Hirabaru of Yabakei in Bunzen; Ahira in Ôsumi. (Pl. XVIII, fig. 1)

Distr. Japan, India, Ceylon, Burma, Sumatra, Europe, N. America, Australia.

Cosmarium striolatum is a characteristic large granulated Cosmaria and is sparsely distributed in Japan. Dr. Yoshik. OKADA has already recorded a form very much like that of *Cosmarium Cohnii* var. *regulare* from middle Japan, but this species is somewhat different from it by the larger size. The arrangement of granules quite coincides with that species by the transverse and oblique series of granules; however the scrobiculations among the granules are in general neglected by the earlier investigators and are not seen in the figures of European form, and this nature of cell wall is probably visible by careful examination and is already shown by HOMFELD. I do not think both the species are a separate one. The form of Mizoro-ike, Kyoto is an intermediate size between the typical form of *Cosmarium striolatum* and *Cosmarium Cohnii* var. *regulare* given by Dr. OKADA.

var. **Nordstedtii** (MÖB.) KRIEGER in Arch. Hydrobiol. suppl. **11**, 186, 1932. — *Pleurotaeniosis tessellata* (DELP.) De TONI var. *Nordstedtii* (MÖBIUS) in Flora **75**, 443, 1892.

var. constrictione profundiore; semicellulae paene circulares, granulis in serie verticalibus et oblique ornatis. Long. 112 μ , Lat. 59 μ , Lat. isth. 45 μ .

Hab. **Hondo**: Nogiwano-kwannon-ike in Iwashiro. (New to Japan) (Pl. XVIII, fig. 2)

Distr. Java, Australia.

Sect. **Orbiculatae** CEDERGREN emend. HIRANO

Cosmarium sect. *Orbiculatae* CEDERGREN in Ark. Bot. **25A**:4, 60, 1933. (pro parte)

Cellulae elongatae, biglobosae, profunde constrictae, sinu aperto; semicellulae globosae, ovaes, ellipticae.

Cosmarium praegrande LUND. in Nov. Act. Regn. Soc. Ups. **3**, VIII, 54, 1871; BÖRGESEN Bot. Tidskr. **17**, 151, 1890; WEST Monogr. Brit. Desm. **3**, 159, 1908; DICK Krypt. Forsch. **1**, 247, 1919; SKUJA Act Horti Bot. Univ. Latv. **7**, 72, 1932; TAYLOR Pap. Mich. Acad. Sci. **19**, 260, 1934.

Cellulae magnae, subduplo longiores quam latiores, profunde constrictae, sinu late aperto; semicellulae sphaericae; membrana granulata, granulis magnis wartiformibus in seriebus radialibus ornatis; membrana inter granulos fine punctata; a vertice visae circulares. Long. 118μ , Lat. 67μ , Lat. isth. 39μ .

Hab. **Hondo**: Fuse-ike in Oomi. (New to Japan) (Pl. XVIII, fig. 10)

Distr. Ceylon, Europe, Greenland, New Foundland.

Subgen. **Eucosmarium** De BARY emend. HIRANO

Cosmarium CORDA sect. *Eucosmarium* De BARY in Unters. ii. Fam. Conj. 72, 1858; PRINTZ Nat. Pflanzenfam. **3**, 355, 1927 — sect. *Microcosmarium* De BARY l. c. 72, 1858 (pro parte) — sect. *Pleurotaeniopsis* LUND. in Nov. Act. Regn. Soc. Ups. **3**, VIII, 51, 1871 (pro parte)

Cellulae semper compressae, in vertice visae ellipticae, oblongae interdum lateribus utrobique cum tumore, distincte constrictae, sinu aperto vel angusto-lineari; semicellulae variables, chromatophoris parietalibus vel axialibus, pyrenoidibus uni vel binis, interdum nonnullis.

- 1a. Membrana glabra, punctata vel scrobiculata.
 - 2a. Semicellulae circulares, ellipticae, reniformes, oblongae vel ovatae. Sect. **Globuliferae**
 - 2b. Semicellulae semicirculares, semiellipticae Sect. **Cyclidium**
 - 2c. Semicellulae pyramidatae vel trapeziformes Sect. **Pyramidatae**
 - 2d. Semicellulae rectangulares Sect. **Quadratifformes**
 - 2e. Semicellulae polygonales Sect. **Microcosmarium**
- 1b. Membrana granulata, verrucosa.
 - 2a. Semicellulae circulares, ellipticae vel reniformes Sect. **Ornatae**
 - 2b. Semicellulae semicirculares, semiellipticae vel subovatae Sect. **Cristatae**
 - 2c. Semicellulae pyramidatae vel trapeziformes Sect. **Margaritiferae**
 - 2d. Semicellulae rectangulares Sect. **Tetridium**

Sect. **Globuliferae** CEDERGREN emend. HIRANO

Cosmarium sect. *Globuliferae* CEDERGREN in Ark. Bot. **25A**: 4, 48, 1933 (pro parte)

Semicellulae circulares, ellipticae, reniformes, oblongae vel ovatae, cellulis generaliter profunde constrictis.

- 1a. Semicellulae ellipticae.
 - 2a. Semicellulae late ellipticae; cellulae circiter $1\frac{1}{2}$ -1.5 longiores quam latiores **C. contractum**.
 - 3a. Cellulae accurate ellipticae, sinu rotundo **f. Jacobsenii**
 - 3b. Cellulae subellipticae, margine ventrali convexiore quam dorsali, sinu acuto.
 - 4a. Cellulae $31-50\mu$ in longitudinem.
 - 5a. Cellulae circiter 1.5 longiores quam latiores, apice convexo **f. typica**
 - 5b. Cellulae circiter $1\frac{1}{2}-1\frac{1}{3}$ longiores quam latiores, apice recto **var. ellipsoideum**
 - 4b. Cellulae $22-24\mu$ in longitudinem **var. minutum**
 - 2b. Semicellulae anguste ellipticae; cellulae circiter tam longae quam latae vel leviter longiores quam latiores.
 - 3a. Membrana incolora.
 - 4a. Sinu modice aperto et rotundo ad extremum.
 - 5a. Cellulae circiter $1\frac{1}{2}$ longiores quam latiores, apice convexo **C. inconspicuum**
 - 5b. Cellulae circiter tam longae quam latae, apice recto **C. asphaerosporum** **var. strigosum**
 - 4b. Sinu profundo, acuto ad extremum.
 - 5a. Cellulae parvae, $14-16\mu$ in longitudinem **C. tenue**
 - 5b. Cellulae $15-21\mu$ in longitudinem **C. bioculatum**
 - 6a. Semicellulae elliptico-oblongae **f. typica**
 - 6b. Semicellulae oblongae.
 - 7a. Sinu angusto-aperto, apice recto **var. depressum**
 - 7b. Sinu acute aperto, apice retuso **var. hians**
 - 3b. Membrana rufa-fuscescens **C. tinctum**
 - 4a. Cellulae sine tumore mediano **f. typica**
 - 4b. Cellulae cum paullo tumore mediano **var. intermedium**
- 1b. Semicellulae elliptico-oblongae, generaliter depressae.
 - 2a. Cellulae $36-50\mu$ in longitudinem **C. depressum**
 - 3a. Semicellulae depresso-subellipticae **f. typica**
 - 3b. Semicellulae subsemicirculari-subellipticae **var. apertum**
 - 3c. Semicellulae subhexagono-ellipticae **var. achondrum**
 - 2b. Cellulae $20-26\mu$ in longitudinem.
 - 3a. Sinu acuto et aperto; semicellulae subellipticae.
 - 4a. Semicellulae elliptico-reniformes **var. minor**
 - 4b. Semicellulae angusto-elliptico-fusiformes **f. minuta**
 - 3b. Sinu angusto-lineari; semicellulae oblongo-subrectangulares.
 - 4a. Membrana granulata, granulis in serie radialibus **var. planctonicum**
 - 4b. Membrana punctata vel glabra **C. subquadrans**
- 1c. Semicellulae reniformes.
 - 2a. Cellulae in vertice visae tumidae.
 - 3a. Semicellulae cum apice protracto **C. bicardia**
 - 3b. Semicellulae cum apice convexo **C. phaseolus** **f. minor**
 - 2b. Cellulae in vertice visae non tumidae.
 - 3a. Cellulae 1.5 longiores quam latiores **C. aversum**
 - 3b. Cellulae $1\frac{1}{2}$ longiores quam latiores **C. pseudoprotuberans**
 - 4a. Semicellulae reniformes.

- 5a. marginibus inferioribus rectis divergentibus..... var. **angustius**
- 5b. marginibus inferioribus rotundis, non rectis var. **Borgei**
- 4b. Semicellulae subhexagono-ellipticae.
 - 5a. Apice convexo.
 - 6a. Cellulae 20-40 μ in longitudinem f. **typica**
 - 6b. Cellulae 12-15 μ in longitudinem f. **minor**
 - 5b. Apice recto var. **alpinum**
- 3c. Cellulae leviter latiores quam longiores, apice recto var. **pygmaeum**

Cosmarium contractum KIRCHN. in WEST Trans. Linn. Soc. Bot. **5**, 70, 1895; Monogr. Brit. Desm. **2**, 170, 1905; MIGULA Krypt. Fl. II, 415, 1907; FUJISAWA Journ. Jap. Bot. **10**, 443, 1934; HIRANO Act. Phytotax. Geobot. **12**, 159, 1943.

Cellulae submediocres, circiter 1.5 longiores quam latiores, profundissime constrictae, sinu aperto sed in apice angusto; semicellulae elliptico-circulares, in parte ventrali convexiore quam dorsali; a latere visae circulares; a vertice visae ellipticae; membrana glabra vel delicatissime punctata; pyrenoidibus singulis centralibus in unoquoque semicellula. Long. 28-34 μ , Lat. 18-21 μ , Lat. isth. 5.3-6 μ , Lat. crass. 16-17 μ .

Hab. **Hokkaido**: Mt. Daisetsu in Ishikari; Tomakomai in Iburi. **Hondo**: Izu-numa, Kesho-numa in Rikuzen; Hirumo-numa in Ugo; Junsai-tsutsumi of Ôishita in Uzen; Nogiwano-kwannon-ike in Iwashiro; Inago of Kitamaki-mura, Ashinota-ike, moor near Kizaki in Shinano; Hichimenzan in Kai; Ishigaki-ike in Ise; Mt. Hira, Fuse-ike, Lake Biwa in Oomi; Ko-ike in Yamashiro; Ikejiri-ike in Tanba. **Kiushiu**: Imuta-ike in Satsuma. (Pl. XX, fig. 2)

Distr. Japan, Manchuria, Siberia, India, Ceylon, Burma, Thailand, Europe, central Africa, Madagascar, N. America, Patagonia.

forma **Jacobsenii** (ROY) W. & G. S. WEST in Monogr. Brit. Desm. **2**, 171, 1905; SKVORTZOW Phillip. Journ. Sci. **49**, 153, 1932.

Semicellulae ordinatim ellipticae, sinu paullo rotundato ad apicem. Long. 34-47.6 μ , Lat. 21-36.4 μ , Lat. isth. 7-11.3 μ .

Hab. **Hokkaido**: Tomakomai in Iburi. **Hondo**: Mt. Hakkoda in Mutsu; Koke-numa in Ugo; Ôishita in Uzen; Higashi-kusano-mura in Oomi; Takaraga-ike in Yamashiro. **Kiushiu**: Yabakei in Bunzen. (Pl. XX, fig. 5)

Distr. Japan, Korea, Siberia, Europe, New Foundland, central Africa.

var. **ellipsoideum** (ELFV.) W. & G. S. WEST in Monogr. Brit. Desm. **2**, 172, 1905; SKVORTZOW Arch. Hydrobiol. **19**, 168, 1928; KRIEGER Arch. Hydrobiol. suppl. **11**, 173, 1932; OKADA Journ. Imp. Fish. Inst. **30**, 164, 1934; TAYLOR Pap. Mich. Acad. Sci. **19**, 252, 1934; HIRANO Act. Phytotax. Geobot. **12**, 87, 1943.

Cellulae breviores et circiter 1½ longiores quam latae; semicellulae ellipticae, in dorsali margine convexiore quam ventrali, sinu angustiore; membrana ferme glabra. Long. 34-47.6 μ , Lat. 25-39 μ , Lat. isth. 7-12.6 μ .

Hab. Hokkaido: Kiritappu in Kushiro; Shimo-yûbetsu in Kitami; Toyokoro, Shikaribetsu-wopputo in Tokachi; Benten-numa, Yûfutsu, Tôasa-numa, Tomakomai in Iburî; Horomui, Nakano near Sapporo in Ishikari. **Hondo**: Kotsutsumi in Mutsu; Koke-numa, Hirumo-numa, Aka-numa, Moritake-ôtsutsumi, Ogata in Ugo; Hizume in Rikuchû; Hakuryu-ko, Ôishita, Chûkawa-ike, Hijiori-naga-numa in Uzen; Izu-numa in Rikuzen; Hibushi-numa, Ojirô, Nanko, Umaushi-numa in Iwaki; Akaiyachi, Kôriyama in Iwashiro; Oze, Ômine-numa in Kôzuke; Mohara in Kamifusa; Takayachi of Mt. Myôko in Echigo; Tanuki-numa in Suruga; Kotsutsumi-nishi-ike, Biwa-ike, Takashihara in Mikawa; Mt. Hira, Lake Biwa, Shinohara-ike, Fuse-ike in Oomi; Toba, Ishigaki-ike, Kanashôzu, Jôdo-ike in Ise; Mizoroga-ike, Takaraga-ike in Yamashiro; Ikejiri-ike in Tanba. **Kiushiu**: Yabakei in Bunzen; Imuta-ike, Lakes Ikeda and Unagi in Satsuma; Ahira in Ôsumi. (Pl. XX, fig. 1, 3, 4)

Distr. Japan, the Kuriles, Siberia, Europe, Iceland, Sumatra, Africa, N. America.

This variety in our country rather coincides with the figure and description given by W. & G. S. WEST in his monograph II, p. 173, pl. 61, f. 33, 1908.

var. **minutum** (Delp.) W. & G. S. WEST in Monogr. Brit. Desm. 2, 173, 1905; INSAM & KRIEGER Hedw. 76, 98, 1937; HIRANO Act. Phytotax. Geobot. 12, 88, 1943. — var. *ellipsoideum* (ELFV.) W. & G. S. WEST in Monogr. Brit. Desm. 2, 173, pl. 61, f. 30-32, 1905.

Semicellulae elliptico-oblongae, sinu angustiore; a latere visae circulares; membrana punctata. Long. 19-28 μ , Lat. 14-22 μ , Lat. isth. 4.3-5.6 μ .

Hab. Hokkaido: Onne-numa in Nemuro; Komukai-ponto, Notoro-ponto in Kitami; Shikaribetsu-wopputo, Toyokoro in Tokachi; Moseushi in Ishikari; Tôasa-numa in Iburî; Shizukari, Ko-numa in Oshima. **Hondo**: Kotsutsumi in Mutsu; Moritake-ôtsutsumi, Megata, Karaso-numa, Koke-numa in Ugo; Ukishima-ônuma, Hijiori-naga-numa, Mazawano-naga-numa in Uzen; Izu-numa in Rikuzen; Akaiyachi, Numanotaira of Mt. Bandai in Iwashiro; Hibushi-numa in Iwaki; Kanazuka-mura, Kurosawano-ike on Mt. Myôko in Echigo; Oze in Kôzuke; Mt. Kirigamine, Daimon-pass, Kanori-ike, Happô-ridge, Ashinota-ike, Kamikôchi in Shinano; Kotsutsumi-nishi-ike in Mikawa; Ishigaki-ike in Ise; Nukigawa in Oomi; Sawano-ike in Yamashiro. **Shikoku**: Shiramizu-pass near Matsuyama in Iyo. **Kiushiu**: Imuta-ike, Nakahara-ike in Satsuma. (Pl. XX, fig. 6)

Distr. Japan, British Isles, Tirol.

Cosmarium inconspicuum ARCH. in WEST Monogr. Brit. Desm. 2, 164, 1905; BERGE Ark. Bot. 18, 9, 1923; KRIEGER Arch. Hydrobiol. suppl. 11, 178, 1932.

Cellulae parvae, leviter longiores quam latiores, profunde constrictae, sinu aperto acutangulo in vertice obtuso; semicellulae transverse subellipticae, apicibus late rectis; a latere visae ovatae; a vertice visae ellipticae; membrana glabra. Long. 12–16.7 μ , Lat. 9.4–15.4 μ , Lat. isth. 4.3–5.6 μ .

Hab. **Hokkaido**: Onne-numa in Nemuro; Kiritappu in Kushiro; Toyokoro in Tokachi; Komukai-ponto, Tôtsuru-numa, Nikuru-numa in Kitami; Tomakomai in Iburi. **Hondo**: Mt. Kurikoma in Ugo; Ôishita in Uzen; Gôno-ike in Hitachi; Mohara in Kamifusa, Happô-ridge in Shinano. **Shikoku**: Sumiyoshi-ike in Tosa. (Pl. XIX, fig. 10)

Distr. Japan, Sumatra, British Isles, Sweden, Arctic Canada.

Cosmarium asphaerosporum NORDST. var. **strigosum** NORDST. in WEST Monogr. Brit. Desm. 2, 164, 1905; SKUJA Act. Horti Bot. Univ. Latv. 3, 149, 1928 (as forma); SKVORTZOW Phillip. Journ. Sci. 49, 150, 1932; KOSSINSKAJA Act. Inst. Bot. Acad. Sci. URSS. Pl. Crypt. 3, 420, 1936; HIRANO Jap. Journ. Bot. 14, 226, 1954.

Var. constrictione profundiore, sinu plus acutangulo, apicibus semicellularum paullo inflatis; a vertice visae ellipticae sine inflatione mediana. Long. et Lat. 9.8 μ , Lat. isth. 6 μ .

Hab. **Hokkaido**: Tôtsuru-numa in Kitami. **Hondo**: Mt. Hachimantai in Mutsu; Kurosawano-ike on Mt. Myôko in Echigo. (Pl. XX, fig. 11)

Distr. Japan, Manchuria, Europe, British Colombia.

Cosmarium tenue ARCH. in WEST Monogr. Brit. Desm. 2, 167, 1905; MIGULA Krypt. Fl. II, 425, 1907; BERNARD Dep. agr. Indes Néerl. 46, 1909; KRIFGER Arch. Hydrobiol. suppl. 11, 188, 1932; TAYLOR Pap. Mich. Acad. Sci. 19, 269, 1934; HIRANO Act. Phytotax. Geobot. 12, 161, 1943.

Cellulae minutae, leviter longiores quam latae, profunde constrictae, sinu aperto ad apicem angusto-lineari; semicellulae transverse ellipticae, apicibus leviter convexis; a latere visae circulares; a vertice visae ellipticae; membrana glabra et incolora. Long. 12.6–14 μ , Lat. 9.8–11.2 μ , Lat. isth. 6.5–8.4 μ , Lat. crass. 8.4 μ .

Hab. **Hokkaido**: Notoro-ponto in Kitami; Daisetsu in Ishikari. **Hondo**: Kôriyama in Iwashiro; Oze-numa, Jiuemon-ike in Kôzuke; Mt. Kirigamine, Inago of Kitamaki-mura in Shinano, Takashihara, Biwa-ike in Mikawa; Fuse-ike, Mt. Hira in Oomi. **Kiushiu**: Bôgatsuru of Mt. Kujû in Bungo. (Pl. XIX, fig. 34)

Distr. Japan, China, Java, Sumatra, Europe, N. America.

Cosmarium bioculatum BRÉB. in RALFS Brit. Desm. 95, 1848; WEST Monogr. Brit. Desm. 2, 165, 1905; G. S. WEST Journ. Linn. Soc. Bot. 38, 116, 1907; MIGULA Krypt. Fl. II, 416, 1907; SMITH Wisc. Bull. 57, 30, 1924; YAMAGUCHI Jap. Journ. Limnol. 11, 119, 1941.

Cellulae aequae parvae, circiter longiores quam latiores, profunde constrictae, sinu angusto-lineari ad apicem sed exterius leviter aperto acutangulo;

semicellulae oblongo-ellipticae, lateribus superioribus et inferioribus aequalibus rotundis, apicibus convexis interdum rectis, et leviter concavis; a latere visae circulares; a vertice visae oblongo-ellipticae; membrana glabra. Long. $18-21\mu$, Lat. $17-19.6\mu$, Lat. isth. $5-5.6\mu$.

Hab. **Hokkaido**: Kiritappu in Kushiro; Yûfutsu in Iburi; Junsai-akunuma in Oshima. **Hondo**: Hakuryu-ko, Chûkawa-ike in Uzen; Hakkaku-ko in Kamifusa; Higusa-numa in Shimofusa; Happô-ridge in Shinano; Fuse-ike in Oomi; Ikejiri-ike in Tanba. (Pl. XIX, fig. 24, 25)

Distr. Japan, Manchuria, China, Siberia, whole Europe, Greenland, Spitzbergen, N. America, Azores, Africa.

forma **depressa** SCHAARSCHM. in WEST Monogr. Brit. Desm. 2, 166, 1905.

Semicellulae subquadratae, angulis rotundis, apicibus late rectis, sinu sublineari-aperto; cellulae in vertice visae oblongae cum lateribus parallelis. Long. 18.2μ , Lat. 22.4μ , Lat. isth. 7μ .

Hab. **Hokkaido**: Tomakomai in Iburi. (New to Asia) (Pl. XIX, fig. 27)

Distr. Europe, U. S. A., New Zealand.

var. **hians** W. & G. S. WEST in Monogr. Brit. Desm. 2, 166, 1905; GRÖNBLAD Act. Soc. Faun. Flor. Fenn. 55, 8, 1924.

Var. sinu cellularum apertiore et nonnihil conico, extremo subacuto, apicibus rectis leviter retusis in medio. Long. $11.2-18.2\mu$, Lat. $11.2-18.2\mu$, Lat. isth. $4.8-5.6\mu$.

Hab. **Hondo**: Nagatai of Mt. Iwaki in Mutsu. **Shikoku**: Yamauchimura in Sanuki; Matsuyama in Iyo. (New to Asia) (Pl. XIX, fig. 26)

Distr. Europe, central Africa.

Cosmarium tinctum RALFS in Brit. Desm. 95, 1848; WEST Monogr. Brit. Desm. 2, 168, 1905; MIGULA Krypt. Fl. II, 424, 1907; KAISER Krypt. Forsch. I, 439, 1926; ALLORGE Rev. Alg. 5, 361, 1930; TAYLOR Pap. Mich. Acad. Sci. 19, 270, 1934; INSAM & KRIEGER Hedw. 76, 110, 1937; HIRANO Act. Phytotax. Geobot. 12, 161, 1943.

Cellulae minutae, circiter 1.5 duplo longiores quam latiores, modice constrictae, sinu aperto ad apice acutangulo; semicellulae ellipticae; a latere visae circulares; a vertice visae ellipticae; membrana glabra nigra-rubescens. Long. $11-16.3\mu$, Lat. $9-10.8\mu$, Lat. isth. $7-7.7\mu$.

Hab. **Hokkaido**: Kiritappu, Tôro-ko in Kushiro; Toyokoro-konuma in Tokachi; Sarufutsu in Kitami; Tomakomai, Yûfutsu, Numanohata in Iburi; Horomui in Ishikari; Shizukari in Oshima. **Hondo**: Akaiyachi in Iwashiro; Daimon-pass, Kizaki, Inago of Kitamaki-mura in Shinano; Tanuki-numa in Suruga; Mt. Hira, Nukigawa in Oomi; Ikejiri-ike in Tanba. **Kiushiu**: Hirabaru of Yabakei in Bunzen. (Pl. XIX, fig. 19)

Distr. Japan, Korea, Manchuria, China, Europe, N. America.

var. **intermedium** NORDST. in Alg. smasaker 162, 1887; K. Sv. Vet. Akad. Handl. 22, 61, 1888; WEST Monogr. Brit. Desm. 2, 169, 1905; MIGULA Krypt. Fl. II, 424, 1907.

Cellulae in vertice visae ellipticae cum paullo inflatione in medio utrobique. Long. $11-12\mu$, Lat. $10.8-11.2\mu$, Lat. isth. $5.6-6.4\mu$.

Hab. **Hokkaido**: Horomui in Ishikari; Junsai-akanuma in Oshima. **Hondo**: Megata, Ogata in Ugo; Saigo-mura in Uzen; Oze in Iwashiro; Kazafuki-ike in Shinano. (Pl. XIX, fig. 20)

Distr. Japan, Europe, New Zealand.

Cosmarium depressum (NÄG.) LUND. in Nov. Act. Regn. Soc. Ups. 3, VIII, 38, 1871; WEST Monogr. Brit. Desm. 2, 176, 1905; MIGULA Krypt. Fl. II, 416, 1907; STRÖM Naturw. Sarek. 3, 474, 1923; SMITH Wisc. Bull. 57, 29, 1924; KRIEGER Arch. Hydrobiol. suppl. 11, 175; 1932; FUJISAWA Journ. Jap. Bot. 10, 445, 1934; TAYLOR Pap. Mich. Acad. Sci. 19, 252, 1934; INSAM & KRIEGER Hedw. 76, 100, 1937.

Cellulae submediocres, leviter latiores quam longiores, profunde constrictae, sinu angusto-lineari ad verticem sed subdilato exteriorius aperto; semicellulae depresso-oblongo-ellipticae, angulis lateralibus parum acute rotundis, apicibus late truncato-convexis; a latere visae circulares; a vertice visae ellipticae; membrana punctata. Long. $33-50\mu$, Lat. $36.4-47.6\mu$, Lat. isth. $10-25\mu$.

Hab. **Hokkaido**: Kiritappu, Tokotan in Kushiro; Toyokoro in Tokachi; Minenobu in Ishikari; Tôasa-numa in Iburi; Shizukari, Ko-numa, Junsai-numa in Oshima. **Hondo**: Kawashiri, Moritake-ôtsutsumi in Ugo; Naganuma, Kobuchi-numa in Rikuzen; Umaushi-numa in Iwaki; Mt. Kirigamine in Shinano; Tamaru, Jôdo-ike in Ise; Nukigawa, Fuse-ike, Lake Biwa in Oomi; Ikejiri-ike in Tanba. (Pl. XIX, fig. 30)

Distr. Japan, India, Ceylon, Burma, Abyssinia, Europe, Greenland, N. America, Australia, Africa.

forma **minuta** HEIMERL in MIGULA Krypt. Fl. II, 416, 1907; KRIEGER Arch. Hydrobiol. suppl. 11, 175, 1932.

Cellulae minores, semicellulae transverse angusto-ellipticae, sinu profundiore. Long. 22.4μ , Lat. 28μ , Lat. isth. $6-7\mu$.

Hab. **Hokkaido**: Toyokoro-konuma in Tokachi. **Hondo**: Chûkawa-ike, Ôishitano-junsaitsumi in Uzen; Nogiwano-kwannon-ike, Akaiyachi in Iwashiro; Takaraga-ike in Yamashiro. (New to Japan) (Pl. XIX, fig. 31)

Distr. Java, Sumatra, Germany.

var. **apertum** (TURNER) HIRANO, comb. nov. *Cosmarium apertum* TURNER in K. Sv. Vet. Akad. Handl. 25, 54, 1893.

Cellulae late ellipticae, profunde constrictae, sinu acuto aperto; semicellulae subsemicirculares, angulis lateralibus acutis et leviter rotundatis, marginibus lateralibus inferioribus paene rectis; a vertice visae angusto-rhomboidae, polis rotundatis. Long. et Lat. 38.7μ , Lat. isth. 10.8μ .

Hab. **Hokkaido**: Yûfutsu in Iburi. (New to Japan) (Pl. XXV, fig. 1)

Distr. India.

var. **achondrum** (BOLDT) W. & G. S. WEST in Monogr. Brit. Desm. 2, 177, 1905; DICK Bot. Arch. 3, 219, 1923, SKUJA Act. Horti Bot. Univ. Latv. 3, 155, 1923; TAFT Ohio Journ. Sci. 45, 192, 1945; WHELDEN Nat. Mus. Canad. Bull. 97, 78, 1947.

Semicellulae quasi elliptico-hexagonales, angulis lateralibus acutius rotundis, in dorsali margine leviter longiore quam ventrali, apicibus latioribus leviter truncatis. Long. $36.4-45\mu$, Lat. $44.8-51.6\mu$, Lat. isth. $11.2-14\mu$.

Hab. **Hondo**: Megata in Ugo; Ikejiri-ike in Tanba. **Kiushiu**: Nakahama of Lake Ikeda in Satsuma. (New to Asia) (Pl. XIX, fig. 32)

Distr. Europe, Iceland, Spitzbergen, Arctic Canada, Uruguay.

var. **minor** W. & G. S. WEST in WEST & CARTER Monogr. Brit. Desm. 5, 263, 1923. — forma SCHRÖDER in Forsch. Biol. Stat. Plön 6, 34, 1898. — var. *japonicum* HIRANO in Mem. Coll. Sci. Univ. Kyoto, B, 19, 66, 1943.

Var. minor quam forma typica; semicellulae parum rhomboido-ellipticae vel depresso-subellipticae; a vertice visae rhomboido-ellipticae; membrana delicatissime punctata. Long. $21-28\mu$, Lat. $21-25.3\mu$, Lat. isth. $4.3-8.4\mu$.

Hab. **Hokkaido**: Tomakomai, Tôasa-numa in Iburi. **Hondo**: Akamizuzawa on Mt. Hakkoda in Mutsu; Hirumo-numa in Ugo; Naga-numa in Rikuzen; Kôriyama in Iwashiro; Mt. Akagi in Kôzuke; Kamikôchi, Shigakôgen in Shinano; Takashihara in Mikawa; Fuse-ike, Shinohara-ike in Oomi; Ishigaki-ike in Ise; Mizoroga-ike, Takaraga-ike in Yamashiro. (Pl. XIX, fig. 33)

Distr. Japan, Europe, Clare Island.

var. **planctonicum** REVERDIN in MESSIKOMMER Hedw. 78, 171, 1933.

Cellulae minores quam in forma typica, sinu angusto-lineari non aperto; semicellulae depresso-reniformes; membrana granulata, granulis minutis, in serie radialibus ornatis; a latere visae circulares. Long. 25.8μ , Lat. 25.8μ , Lat. isth. 6.5μ . (New to Asia) (Pl. XXV, fig. 2)

Hab. **Hokkaido**: Shizukari in Oshima.

Distr. Europe.

Cosmarium subquadrans W. & G. S. WEST in Monogr. Brit. Desm. 2, 178, 1905; DICK Mitt. Pfälz Ver. Pollichia n. f. 3, 134, 1930.

Cellulae parvae, leviter latiores quam longiores, profunde constrictae, sinu angusto-lineari ad apice leviter ampliato; semicellulae late subrecto-angulares, angulis basalibus rotundis, marginibus lateralibus subparallelis in parte inferiore, gradatim alte convergentibus, angulis apicalibus late rotundis, apicibus rectis leviter retusis, aliquantum leviter convexis; a latere visae circulares; a vertice visae oblongo-ellipticae; membrana glabra. Long. 15.4–22.4 μ , Lat. 18.3–25.2 μ , Lat. isth. 6–7 μ .

Hab. **Hondo**: Bora-numa in Mutsu; Ukishima-ô-numa in Uzen; Rokujizo in Yamashiro. **Kiushiu**: Nakahama of Lake Ikeda in Satsuma. (New to Asia) (Pl. XIX, fig. 18)

Distr. British Isles, Germany.

Cosmarium bicardia REINSCH in Contr. Alg. Fung. 83, 1875; BORGE Bih. K. Sv. Vet. Akad. Handl. 19, 31, 1894; Ark. Bot. 6, 43, 1906 (as forma); MIGULA Krypt. Fl. II, 424, 1907.

Cellulae parvae, leviter longiores quam latiores, profunde constrictae, sinu angusto-lineari ad apice leviter dilatato; semicellulae subreniformes, marginibus lateralibus inferioribus leviter convexis et divergentibus, marginibus lateralibus superioribus alte convergentibus, apicibus angustis et rectis, angulis lateralibus rotundis, angulis basalibus obtusis et rotundis; a latere visae subcirculares, lateribus cum paullo inflatione in medio utrobique; a vertice visae oblongo-ellipticae, lateribus cum late inflatione ad medium utrobique. Long. 28–29 μ , Lat. 25 μ , Lat. isth. 7 μ .

Hab. **Hokkaido**: Horomui in Ishikari; Tomakomai in Iburi. (New to Japan) (Pl. XX, fig. 16)

Distr. Burma, Europe.

Cosmarium phaseolus BRÉB. forma **minor** BOLDT in WEST Monogr. Brit. Desm. 2, 159, 1905; GRÖNBLAD Mem. Soc. Faun. Flor. Fenn. 10, 267, 1934; HIRANO Act. Phytotax. Geobot. 12, 160, 1943.

Cellulae minores. Long. 18–22.4 μ , Lat. 16.8–23.8 μ , Lat. isth. 5.6–7 μ .

Hab. **Hokkaido**: Nakano near Sapporo in Ishikari. **Hondo**: Izu-numa in Rikuzen; Goda-numa in Shimofusa; Mt. Hira in Oomi. **Kiushiu**: Ahira in Ôsumi; Miyazaki in Hiuga. (Pl. XIX, fig. 21)

Distr. Japan, Siberia, England, Finland, Greenland.

Cosmarium aversum W. & G. S. WEST in Trans. Linn. Soc. Bot. 5, 70, 1895.

Cellulae subparvae, circiter 1.5 duplo longiores quam latiores, profundissime constrictae, sinu aperto in capite leviter rotundato; semicellulae parum obsemicirculari-suboptagonales vel depresso-pyriformes, angulis basalibus obtuse rotundis, marginibus lateralibus leviter convexis vel paene rectis,

angulis apicalibus bene rotundis, apicibus rectis vel leviter retusis; a vertice visae subcirculares; membrana punctata. Long. 44μ , Lat. 28μ , Lat. isth. 11.3μ .

Hab. **Hondo**: Fuse-ike in Oomi. (New to Japan) (Pl. XX, fig. 22)

Distr. Ceylon, Madagascar.

Cosmarium pseudoprotuberans KIRCHN. in JOHNSON Bull. Torrey Bot. Club **22**, 293, 1895; WEST Journ. Roy. Micr. Soc. 155, 1896; Monogr. Brit. Desm. **3**, 82, 1908; SKVORTZOW Phillip. Journ. Sci. **49**, 152, 1932; TAFT Ohio Journ. Sci. **45**, 198, 1945.

Cellulae subparvae, leviter longiores quam latiores, profunde constrictae, sinu aperto et angusto ad verticem; semicellulae transverse subelliptico-hexagonales, angulis lateralibus obtusis, marginibus lateralibus superioribus et inferioribus leviter convexis, inferioribus leviter longioribus quam superioribus, apicibus truncato-convexis; a latere visae subcirculares; a vertice visae subrhomboido-ellipticae, polis obtuse rotundis; membrana punctata. Long. 15.4 – 22.4μ , Lat. 12.6 – 15.4μ , Lat. isth. 2.8 – 4.2μ .

Hab. **Hondo**: Hachimantai in Mutsu; Hakuryu-ko in Uzen; Daimonpass, Shijûhachi-ike of Shigakôgen, Inago of Kitamaki-mura in Shinano; Nukigawa near Lake Biwa in Oomi; Mizoroga-ike in Yamashiro. (Pl. XX, fig. 14)

Distr. Japan, India, Europe, U. S. A., Canada, Africa.

var. **minor** SCHMIDLE in Flora **78**, 58, 1894. — forma *minus* KOSSINSK. in Act. Inst. Bot. Acad. Sci. URSS, Pl. Crypt. 424, 1936.

Cellulae minores. Long. 11.2μ , Lat. 9.8μ , Lat. isth. 2μ .

Hab. **Hondo**: Tanuki-numa in Suruga. (New to Japan) (Pl. XX, fig. 33)

Distr. Siberia, Europe.

var. **angustius** NORDST. in K. Sv. Vet. Akad. Handl. **22**, 58, 1888; MIGULA Krypt. Fl. II, 431, 1907; WEST Monogr. Brit. Desm. **3**, 56, 1908.

Semicellulae subellipticae, marginibus lateralibus plus rotundioribus quam in forma typica, sinu angusto-lineari superius subampliato et exterius aperto, angulis lateralibus rotundis, apicibus late convexis; membrana punctata. Long. 30.8 – 36.4μ , Lat. 25.2 – 28μ , Lat. isth. 7 – 11μ .

Hab. **Hondo**: Chûkawa-ike in Uzen; Ozegahara in Kôzuke; Gôno-ike in Hitachi; Mohara in Kamifusa; Higusa-numa in Shimofusa; Lake Nakatsuna in Shinano. (Pl. XX, fig. 12)

Distr. Japan, Europe, New Zealand.

The form from New Zealand has somewhat obtuse superior lateral angles, while in our form the superior angles are well rounded.

var. **Borgei** INSAM & KRIEGER in Hedw. 76, 106, 1936.

Semicellulae plus rotundatae quam in forma typica, angulis lateralibus bene rotundatis non obtusis, apicibus semicellularum vix rectis, marginibus lateralibus superioribus convexis aliquando rectis, sinu anguste lineari non obtuso et non acute aperto ad apicem; a vertice visae ellipticae. Long. 30μ , Lat. 23.7μ , Lat. isth. 8μ .

Hab. **Hokkaido**: Benten-numa in Iburi. (New to Asia) (Pl. XXV, fig. 3)
Distr. Europe.

var. **alpinum** RACIB. in WEST Monogr. Brit. Desm. 3, 83, 1908.

Cellulae minores; semicellulae obtrapeziformes; sinu angusto-lineari non aperto, angulis basalibus obtusis, marginibus lateralibus leviter convexis, angulis apicalibus bene rotundis, apicibus late rectis. Long. $15.4-21\mu$, Lat. $12.6-15.4\mu$, Lat. isth. $4-4.3\mu$.

Hab. **Hokkaido**: Kiritappu in Kushiro. **Hondo**: Ôishita in Uzen; Ariga-ike in Yamashiro. (New to Asia) (Pl. XX, fig. 13)

Distr. Scotland, Germany, Poland.

var. **pygmaeum** GUTW. in MESSIKOMMER Beitr. geobot. Landes. Schweiz 24, 147, 1942.

Semicellulae reniforme-rectangulares, angulis lateralibus obtuse rotundatis, marginibus lateralibus inferioribus leviter divergentibus et rectis, apicibus latis et paene rectis aliquando vix retusis et aliquando paullo convexis, sinu profundo et anguste lineari. Long. 16.3μ , Lat. 17.3μ , Lat. isth. 4.3μ .

Hab. **Hokkaido**: Minenobu in Ishikari; Yûfutsu in Iburi. (New to Asia) (Pl. XXV, fig. 4)

Distr. Europe.

Plate X.

1. <i>Pleurotaenium minutum</i> (RALFS) DELP. var. <i>elongatum</i> (W. & G. S. WEST) CEDERGREN	62
2. <i>Pl. minutum</i> var. <i>cylindricum</i> (BORGE) KRIEGER	61
3. <i>Pl. Trabecula</i> (EHRENB.) NÄG. var. <i>crassum</i> WITTR.	63
4. <i>Pl. Trabecula</i> var. <i>rectum</i> (DELP.) W. & G. S. WEST	63
5. <i>Pl. Trabecula</i> (EHRENB.) NÄG.	62
6. <i>Pl. minutum</i> (RALFS) DELP. var. <i>latum</i> KAISER	61
7. <i>Pl. minutum</i> (RALFS) DELP.	60
8. <i>Pl. Trabecula</i> (EHRENB.) NÄG.	62
9. <i>Pl. minutum</i> (RALFS) DELP.	60
10. <i>Pl. minutum</i> var. <i>crassum</i> (W. WEST) KRIEGER	61
11. <i>Pl. Trabecula</i> (EHRENB.) NÄG.	62
12. <i>Pl. baculoides</i> (ROY & BISS.) Playfair	62
13. <i>Docidium baculum</i> BRÉB.	57
14. <i>D. undulatum</i> BAIL.	58
15. <i>Closterium Baillyanum</i> BRÉB.	39

1, 2, 4-6, 8, 12. ($\times 360$) ; 3. ($\times 200$) ; 7, 9, 11, 15. ($\times 300$) ;
10, 13, 14. ($\times 500$)

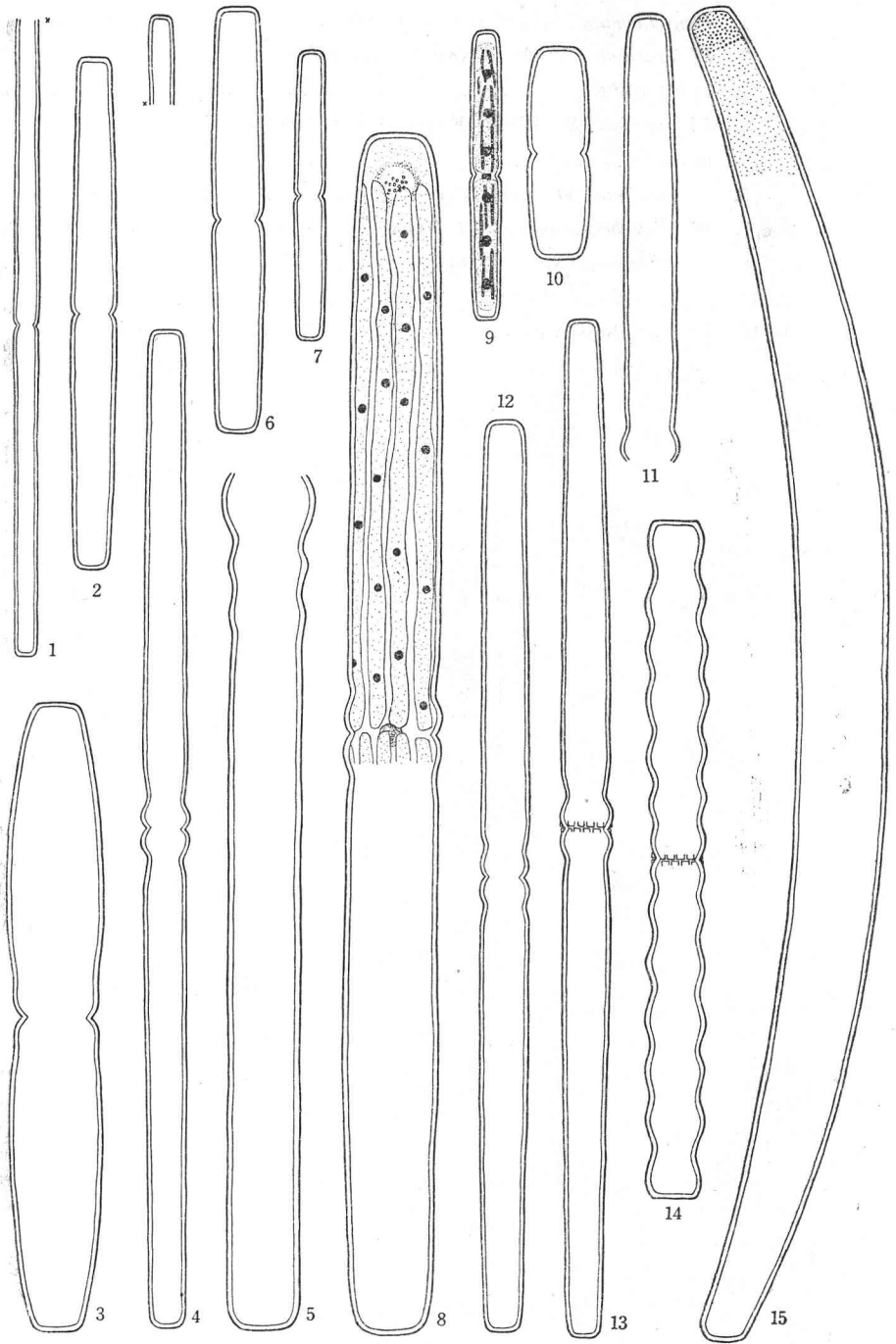


Plate XI.

1.	<i>Pleurotaenium indicum</i> (GRUN.) LUND.	64
2.	<i>Pl. Trabecula</i> (EHRENB.) NÄG. var. <i>elongatum</i> CEDERGREN	64
3.	<i>Pl. annulare</i> (W. WEST) KRIEGER var. <i>zonatum</i> HIRANO	64
4, 5.	<i>Pl. excelsum</i> (TURNER) GUTW.	67
6, 7.	<i>Pl. Ehrenbergii</i> (BRÉB.) De BARY	65
8.	<i>Pl. Ehrenbergii</i> var. <i>curtum</i> KRIEGER	65
9, 10.	<i>Pl. Ehrenbergii</i> (BRÉB.) De BARY	65
11, 12.	<i>Pl. Ehrenbergii</i> var. <i>undulatum</i> SCHAARSCHM.	66
1, 2. (× 350) ; 3-10. (× 300) ; 11, 12. (× 400)		

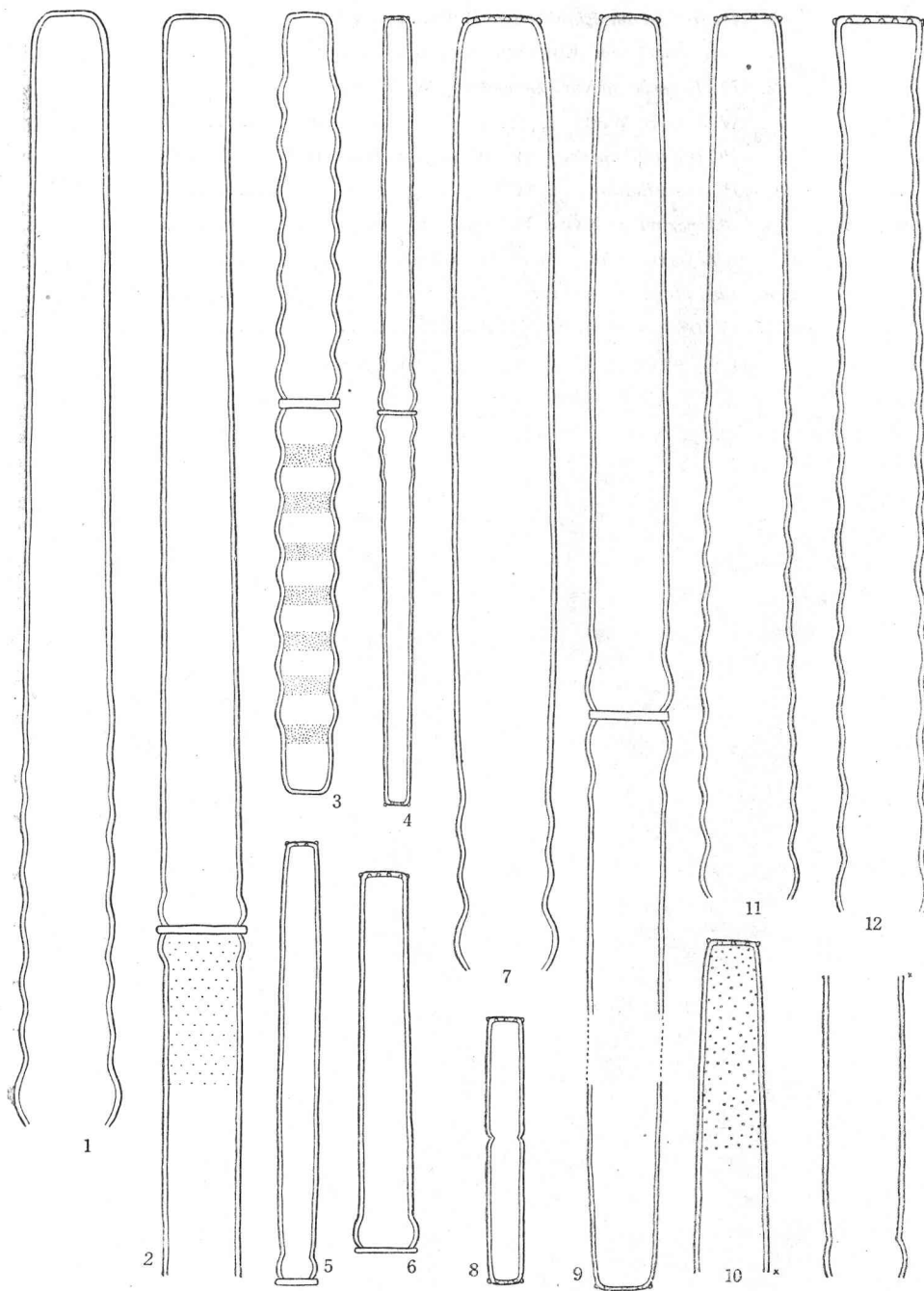


Plate XII.

1.	<i>Pleurotaenium Ehrenbergii</i> (BRÉB.) De BARY	
	var. <i>crenulatum</i> (EHRENB.) KRIEGER	65
2.	<i>Pl. Ehrenbergii</i> var. <i>elongatum</i> (W. WEST)	
	W. & G. S. WEST	66
3.	<i>Pl. tridentulum</i> (WOILE) WEST var. <i>breve</i> HIRANO	68
4.	<i>Pl. mamillatum</i> G. S. WEST	69
5.	<i>Pl. inermium</i> (MÖB.) HIRANO	71
6, 7.	<i>Ichthyocercus longispinus</i> (BORGE) KRIFGER	73
8, 9.	<i>Pleurotaenium nodosum</i> (BAII.) LUND.	70
10, 11.	<i>Pl. truncatum</i> (BRÉB.) NÄG.	66
	1, 2. (× 380) ; 3, 6, 7. (× 600) ; 4, 5, 8-11. (× 300)	

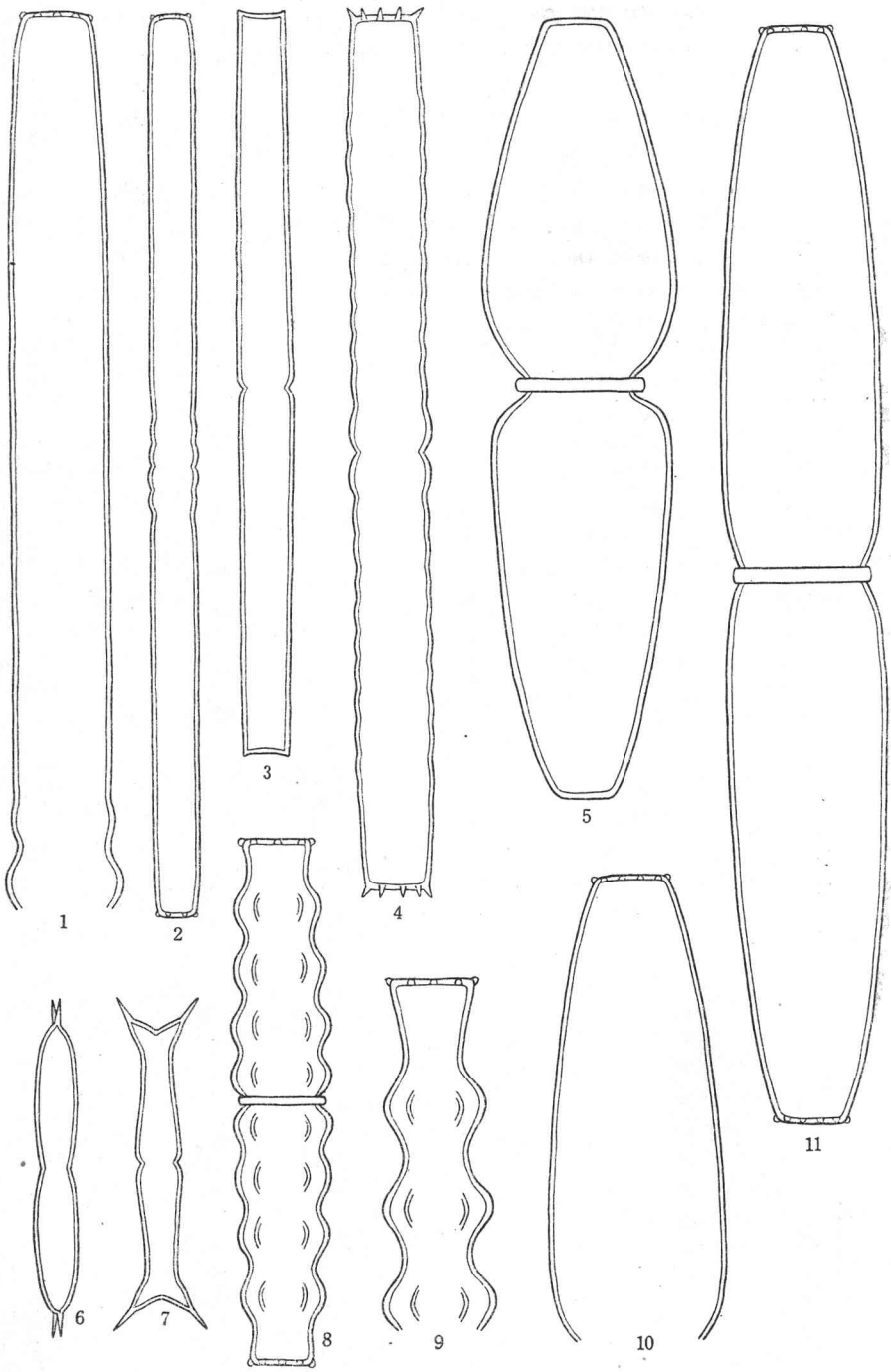


Plate XIII.

1. <i>Pleurotaenium repandum</i> (WOLLE) KRIEGER	64
2. <i>Pl. eugeneum</i> (TURNER) W. & G. S. WEST	66
3. <i>Pl. elatum</i> (TURNER) BERGE	68
4. <i>Pl. elatum</i> var. <i>subundulatum</i> HIRANO	68
5. <i>Pl. simplicissimum</i> GRÖNBL. var. <i>semiundatum</i> HIRANO ..	67
6. <i>Pl. simplicissimum</i> GRÖNBL.	67
7. <i>Tetmemorus Brépissonii</i> (MENECH.) RALFS	
var. <i>minor</i> De BARY	74
8. <i>Tet. Brébissonii</i> (MENECH.) RALFS	74
1. (× 300) ; 2, 6. (× 320) ; 3-5. (× 380) ; 7, 8. (× 500)	

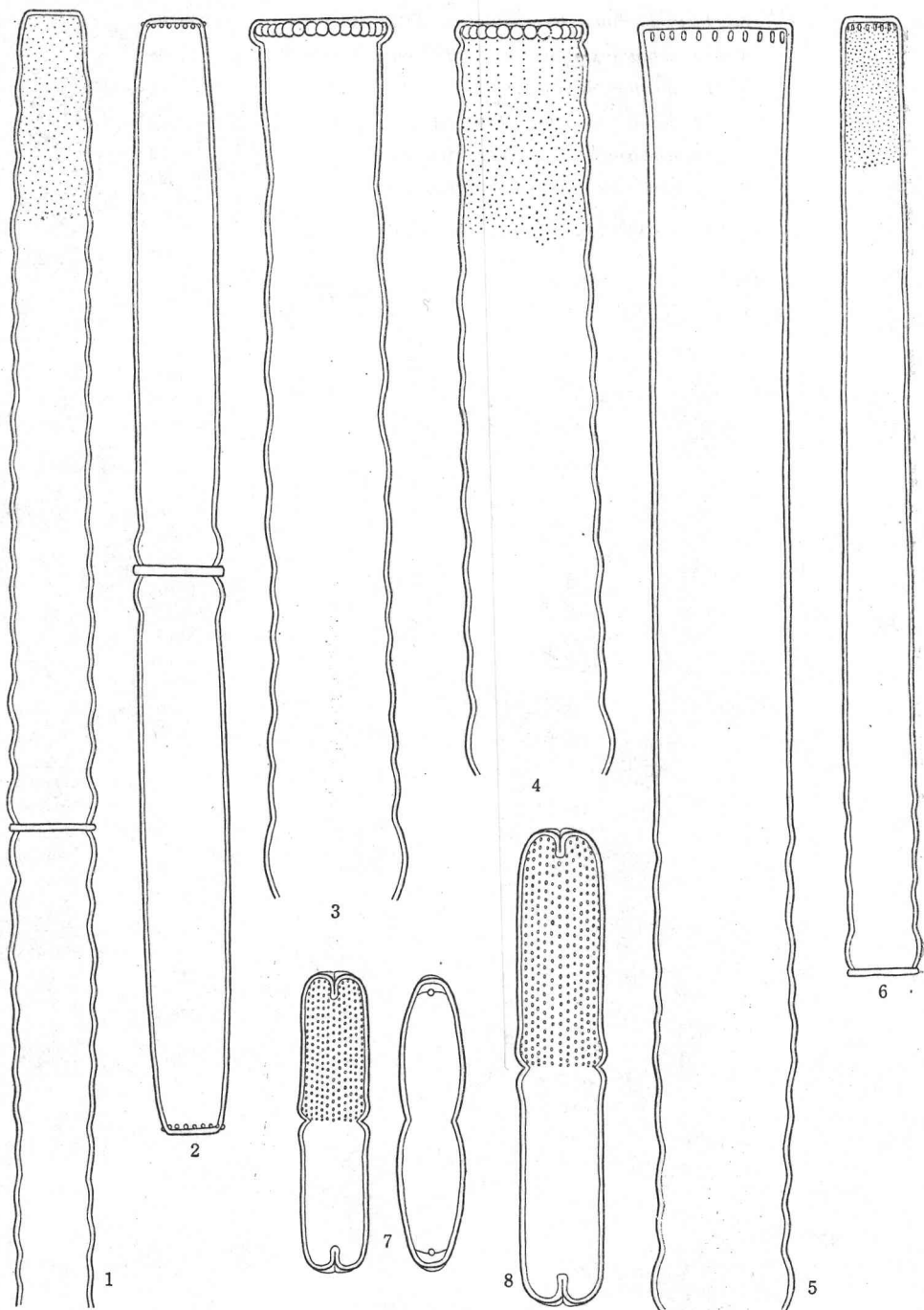


Plate XIV.

1-3.	<i>Pleurotaenium subcoronulatum</i> (TURNER) W. & G. S. WEST	68
4.	<i>Pl. subcoronulatum</i> var. <i>africanum</i> SCHMIDLE	68
5.	<i>Pl. ovatum</i> NORDST.	71
6.	<i>Pl. Kayei</i> (ARCHER) RABENH.	71
7.	<i>Tetmemorus laevis</i> (KÜTZ.) RALFS	74
8.	<i>T. laevis</i> var. <i>tropicus</i> KRIEGER	75
1-5. (×420) ; 6. (×300) ; 7, 8. (×500)		

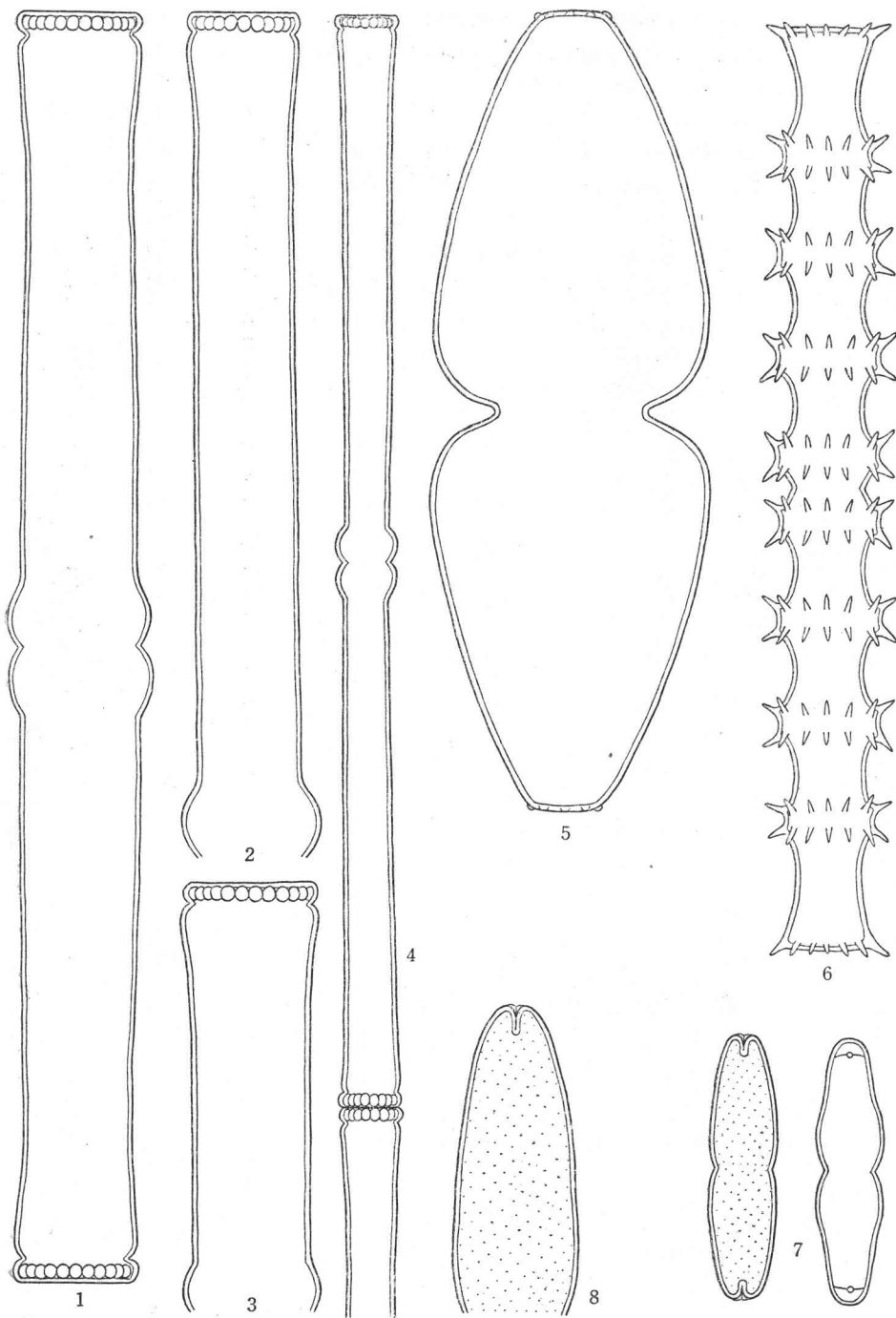


Plate XV.

1.	<i>Pleurotaenium verrucosum</i> (BAIL.) LUND.	69
2.	<i>Pl. trochiscum</i> W. & G. S. WEST	69
3, 4.	<i>Triploceras gracile</i> BAIL.	72
5, 6.	<i>Tetmemorus granulatus</i> (BRÉB.) RALFS	75
7, 8.	<i>Cosmarium australe</i> (RACIB.) LÜTKEM.	86
9, 10.	<i>C. goniodes</i> W. & G. S. WEST	78
11.	<i>C. diploporum</i> (LUND.) LÜTKEM.	79
12.	<i>C. diploporum</i> var. <i>major</i> WEST	80
13-15.	<i>C. alpestre</i> ROY & BISS.	86
1, 5-8. (×500) ; 2. (×370) ; 3, 4. (×350) ; 9-11, 12. (×560) ;		
13-15. (×400)		

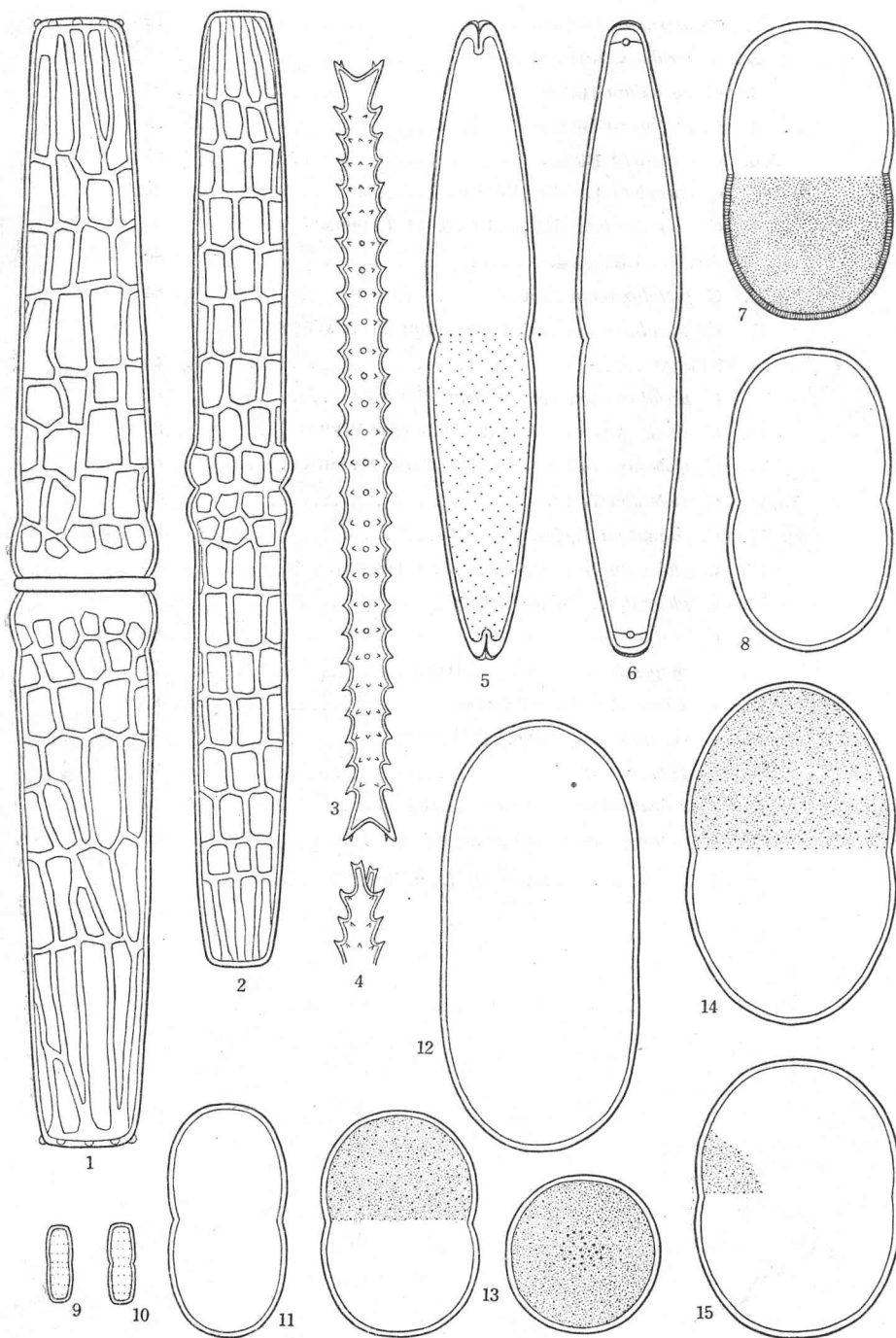


Plate XVI.

1.	<i>Cosmarium oblongum</i> BENNETT	79
2.	<i>C. viride</i> (CORDA) JOSHUA	82
3.	<i>C. parvulum</i> BRÉB.	82
4.	<i>C. oblongum</i> BENNETT	79
5, 6.	<i>C. cucurbita</i> BRÉB.	81
7.	<i>C. cucurbita</i> f. <i>latior</i> WEST	81
8.	<i>C. cucurbitinum</i> (BISS.) LÜTKEM. f. <i>minor</i> (WEST) LÜTKEM.	80
9, 10.	<i>C. pseudarctoum</i> NORDST.	84
11.	<i>C. pseudarctoum</i> var. <i>perminutum</i> (G. S. WEST) STRÖM	84
12.	<i>C. pseudarctoum</i> var. <i>colorum</i> HIRANO	84
13.	<i>C. viride</i> (CORDA) JOSHUA f. <i>minor</i> WEST	82
14.	<i>C. globosum</i> BULNH. var. <i>subaltum</i> MESSIJK.	84
15, 16.	<i>C. globosum</i> BULNH.	82
17.	<i>C. connatum</i> BRÉB.	88
18.	<i>C. globosum</i> BULNH. var. <i>minus</i> HANSK.	84
19.	<i>C. globosum</i> f. <i>minor</i> BOIDT	83
20.	<i>C. curtum</i> (BRÉB.) RALFS	85
21.	<i>C. magellanicum</i> (BORGE) HIRANO	79
22.	<i>C. Clevei</i> (LUND.) LÜTKEM.	80
23.	<i>C. cucurbitinum</i> (BISS.) LÜTKEM.	80
24.	<i>C. Hibernicum</i> WEST	78
25.	<i>C. subturgidum</i> (TURNER) SCHMIDLE	85
26.	<i>C. subturgidum</i> f. <i>minor</i> SCHMIDLE	85

1-4, 8-23, 25, 26. (× 600) ; 5-7. (× 530) ; 24. (× 550)

